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Political Essay

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KINGDOM OF NEW SPAIN.

CONTAINING

Researches relative to the Geography of Mexico, the Extent of its Surface and its political Division into Intendancies, the physical Aspect of the Country, the Population, the State of Agriculture and Manufacturing and Commercial Industry, the Canals projected between the South Sea and Atlantic Ocean, the Crown Revennes, the Quantity of the precious Metals which have flowed from Mexico into Europe and Asia, since the Discovery of the New Continent, and the Military Defence of New Spain.

BY ALEXANDER DE HUMBOLDT.

WITH

PHYSICAL SECTIONS AND MAPS,

FOUNDED ON ASTRONOMICAL OBSERVATIONS, AND TRIGONOMETRICAL AND BAROMETRICAL MEASUREMENTS.

TRANSLATED FROM THE ORIGINAL FRENCH

BY JOHN BLACK.

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STATISTICAL ANALYSIS

OF

THE KINGDOM OF

NEW SPAIN.

Territorial extent: 118,478 square leagues * (2,339,400 myriares.)

Population: 5,837,100 inhabitants,
or 49 inhabitants per square league ($2\frac{1}{4}$ per myriare).

* Of 25 to the degree.—*Trans.*

NEW SPAIN comprehends

A. *Mexico Proper (el Reyno de Mexico.)*

Territorial extent: 51,250 square leagues, or (1,015,640 myriares).

Population: 5,413,900 inhabitants,
or 105 inhabitants per square league.

B. *Las provincias internas orientales y occidentales.*

Territorial extent: 59,375 square leagues (or 1,323,700 myriares).

Population: 357,200 inhabitants,
or 6 inhabitants to the square league.

NEW SPAIN.

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No of Inhabitants to the square League.
I. Intendancy of Mexico.	1,511,800	5,927	255

THE whole of this intendancy is situated under the torrid zone. It extends from the 16° 34′ to the 21° 57′ of north latitude. It is bounded on the north by the intendancy of San Luis Potosi, on the west by the intendancies of Guanaxuato and Valladolid, and on the east by those of Vera Cruz and La Puebla. It is washed towards the south by the South Sea, or Great Ocean, for a length of coast of 82 leagues from Acapulco to Zacatula.

Its greatest length from Zacatula to the mines of the Doctor * is 136 leagues; and its greatest

* The extreme points are properly situated to the south-east of Acapulco, near the mouth of the Rio Nespa, and to the north of the Real del Doctor, near the city of Valles, which

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breadth from Zacatula to the mountains situated to the east of Chilpansingo is 92 leagues. In its northern part, towards the celebrated mines of Zimapan and the Doctor, it is separated by a narrow stripe from the Gulph of Mexico. Near Mextitlan, this stripe is only nine leagues in breadth.

More than two-thirds of the intendancy of Mexico are mountainous, in which there are immense plains, elevated from 2000 * to 2300 † metres above the level of the ocean. From Chalco to Queretaro are almost uninterrupted plains of fifty leagues in length and eight or ten in breadth. In the neighbourhood of the western coast the climate is burning and very unhealthy. One summit only, the Nevado de Toluca, situated in a fertile plain of 2700 ‡ metres in height, enters the region

belongs to the intendancy of San Luis Potosi. Places of note being seldom situated on the very boundaries, we have preferred naming those which are nearest to them. A glance bestowed on my general map of New Spain will serve to justify this mode of indicating the boundaries of the intendancies.

* 6561 feet. *Trans.* † 7545 feet. *Trans.*

‡ 8857 feet. *Trans.*

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of perpetual snow. Yet the porphyritical summit of this old volcano, whose form bears a strong resemblance to that of Pichincha near Quito, and which appears to have been formerly extremely elevated, is uncovered with snow in the rainy months of September and October. The elevation of the Pico del Fraile, or the highest summit of the Nevado de Toluca, is 4620 metres * (2370 toises). No mountain in this intendancy equals the height of Mount Blanc.

The valley of Mexico, or Tenochtitlan, of which I publish a very minute map, is situated in the centre of the Cordillera of Anahuac, on the ridge of the porphyritical and basaltic amygdaloid mountains, which run from the S.S.E. to the N.N.W. This valley is of an oval form. According to my observations, and those of a distinguished mineralogist, M. Don Luis Martin, it contains from the entry of the Rio Tenango into the lake of Chalco, to the foot of the Cerro de

* 15156 feet. *Trans.*

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Sincoque, near the Desague Real of Huehuetoca, 18½ leaguesin length, and from S. Gabriel, near the small town of Tezcuco, to the sources of the Rio de Fscapusalco, near Guisquiluca, 12½ leagues in breadth *. The territorial extent of the valley is 244½ square leagues, of which only 22 square leagues are occupied by the lakes, which is less than a tenth of the whole surface.

The circumference of the valley, reckoning from the crest of the mountains which surround it like a circular wall, is 67 leagues. This crest is most elevated on the south, particularly on the south-east, where the great volcanos of La Puebla, the Popocatepetl and Iztaccihuatl, bound the valley. One of the roads which lead from the valley of

* The maps of the valley of Mexico hitherto published are so false, that in that of M. Mascaro, annually repeated in the almanac of Mexico, the above distances are 25 and 17 instead of 18 and 12 leagues. It is from this map undoubtedly that the archbishop Lorenzana gives the whole valley a circumference of more than 90 leagues, while the amount is almost one-third less.

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Tenochtitlan to that of Cholula and La Puebla passes even between the two volcanos, by Tlamanalco, Ameca, La Cumbre, and La Cruz del Coreo. The small army of Cortez passed by this road on his first invasion.

Six great roads cross the Cordillera which incloses the valley, of which the medium height is 3000 metres* above the level of the ocean. 1. The road from Acapulco to Guchilaque and Cuervaracca by the high summit called la Cruz del Marques †; 2. the road of Toluca by Tianguillo and Lerma, a magnificent causeway, which I could not sufficiently admire, constructed with great art, partly

* 9842 feet. *Trans.*

† It was a military position in the time of the conquest. When the inhabitants of New Spain pronounce the word *el Marques*, without adding a family name, the name of Hernan Cortes, Marques de el Valle de Oaxaca, is understood. In the same way, *el Almirante* designates, in Spanish America, Christopher Columbus. This naive manner of expressing themselves proves the respect and admiration which they preserve for the memory of these great men.

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over arches; 3. the road of Queretaro, Guanaxuato, and Durango *el camino de tierra adentro*, which passes by Guautitlan, Huehuetoca, and the Puerto de Reyes, near Bata, through hills scarcely 80* metres above the pavement of the great square *(place)* of Mexico; 4. the road of Pachuco, which leads to the celebrated mines of Real del Monte, by the Cerro Ventoso, covered with oak, cypress, and rose trees, almost continually in flower; 5. the old road of La Puebla, by S. Bonaventura and the Llanos de Apan; and, 6, the new road of La Puebla by Rio Frio and Tesmelucos, south-east from the Cerro del Telapon, of which the distance from the Sierra Nevada, as well as that from the Sierra Nevada (Iztaccihuatl) to the great volcano (Popocatepetl), served for bases to the trigonometrical operations of MM. Velasquez and Costanzo.

From being long accustomed to hear the capital of Mexico spoken of as a city built in the midst of a lake, and connected with the continent merely by

* 262 feet. *Trans.*

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dikes, those who look at my map will be no doubt astonished on seeing that the centre of the present city is 4500 metres * distant from the lake of Tescuco, and more than 9000 † from the lake of Chalco. They will be inclined, therefore, either to doubt the accuracy of the descriptions in the history of the discoveries of the new world, or they will believe that the capital of Mexico does not stand on the same ground with the old residence of Montezuma ‡: but the city has certainly not changed its place, for the cathedral of Mexico occupies exactly the ground where the temple of Huitzilopochtli stood, and the present street of Tacuba is the old street of Tlacopan, through which Cortez made his famous retreat in the

* 14763 feet. *Trans.* † 29527 feet. *Trans.*

‡ The true Mexican name of this king is *Moteuczoma*. There are two kings of the name in the genealogy of the Aztec sultans. The first was called *Huehue Moteuczoma*, and the second, who died prisoner of Cortez, *Moteuczoma Xocojotzin*. The adjectives before and after the proper name signify older and younger.

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melancholy night of the 1st of July, 1520, which goes by the name of *Noche triste*. The difference of situation between the old maps and those published by me arises solely from the diminution of water of the lake of Tezcuco.

It may be useful in this place to lay before the readers a passage from a letter addressed * by Cortez to the emperor Charles the Fifth, dated 30th October, 1520, in which he gives the description of the valley of Mexico. This passage, written with great simplicity of style, gives us at the same time a very good idea of the sort of police which prevailed in the old Tenochtitlan. "The province in which the residence of this great lord *Muteczuma* is situated," says Cortez, "is circularly surrounded with elevated mountains, and intersected with precipices. The plain contains near 70 leagues in circumference, and in this plain are two lakes, which fill nearly the whole valley; for the inhabitants sail in canoes for more than 50 leagues

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round."—(We must observe that the general speaks only of two lakes, because he knew but imperfectly those of Zumpango and Xaltocan, between which he hastily passed in his flight from Mexico to Tlascala, before the battle of Otumba.) "Of the two great lakes of the valley of Mexico, the one is fresh and the other salt water.—They are separated by a small range of mountains (the conical and insulated hills near Iztapalapan); these mountains rise in the middle of the plain, and the waters of the lakes mingle together in a strait between the hills and the high Cordillera (undoubtedly the eastern declivity of Cerros de Santa Fe). The numerous towns and villages constructed in both of the two lakes carry on their commerce by canoes, without touching the continent. The great city of Temixtitan * (Tenoch-

* Temistitan, Temixtitan, Tenoxtitlan, Temihtitlan, are all vicious alterations of the true name of Tenochtitlan. The Aztecs, or Mexicans, called themselves also *Tenochques*, from whence the denomination of *Tenochtitlan* is derived.

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titlan) is situated in the midst of the salt-water lake, which has its tides like the sea; and from the city to the continent there are two leagues whichever way we wish to enter. Four dikes lead to the city: they are made by the hand of man, and are of the breadth of two lances. The city is as large as Seville or Cordova. The streets, I merely speak of the principal ones, are very narrow and very large; some are half dry and half occupied by navigable canals, furnished with very well constructed wooden bridges, broad enough for ten men on horseback to pass at the same time. The market-place, twice as large as that of Seville, is surrounded with an immense portico, under which are exposed for sale all sorts of merchandize, eatables, ornaments made of gold, silver, lead, pewter, precious stones, bones, shells, and feathers; delft ware, leather, and spun cotton. We find hewn stone, tiles, and timber fit for building. There are lanes for game, others for roots and garden fruits: there are houses where barbers shave the head (with razors made

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of obsidian; and there are houses resembling our apothecary shops, where prepared medicines, unguents, and plasters are sold. There are houses where drink is sold. The market abounds with so many things, that I am unable to name them all to your highness. To avoid confusion, every species of merchandize is sold in a separate lane; every thing is sold by the yard, but nothing has hitherto been seen to be weighed in the market. In the midst of the great square is a house which I shall call *l'audiencia*, in which ten or twelve persons sit constantly for determining any disputes which may arise respecting the sale of goods. There are other persons who mix continually with the crowd, to see that a just price is asked. We have seen them break the false measures which they had seized from the merchants."

Such was the state of Tenochtitlan in 1520, according to the description of Cortez himself. I have sought in vain in the archives of his family, preserved at Mexico in the Casa del Estado, for the plan which this great captain ordered to be

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drawn up of the environs of the capital, and which he sent to the emperor, as he says, in his third letter published by Cardinal Lorenzana. The Abbe Clavigero has ventured to give a plan of the lake of Tezcuco, such as he supposes it to have been in the sixteenth century. This sketch is very inaccurate, though much preferable to that given by Robertson, and other European authors, equally unskilled in the geography of Mexico. I have drawn on the map of the valley of Tenochtitlan the old extent of the salt-water lake, such as I conceived it from the historical account of Cortez, and some of his contemporaries. In 1520, and long after, the villages of Iztapalapan, Coyohuacan (improperly called Cuyacan), Tacubaja, and Tacuba were quite near the banks of the Lake of Tezcuco. Cortez says, expressly*, that the most part of the houses of Coyohuacan, Culuacan, Chulubuzco, Mexicaltzingo, Iztapalapan, Cuitaguaca, and Mizqueque, were built in the

* Lorenzana, p. 229, 195, 102.

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water on piles, so that frequently the canoes could enter by an under door. The small hill of Chapoltepec, on which the viceroy Count Galvez constructed a castle, was no longer an island in the lake of Tezcuco in the time of Cortez. On this side the continent approached to within about 3000 metres* of the city of Tenochtitlan, consequently the distance of two leagues indicated by Cortez in his letter to Charles V. is not altogether accurate: he ought to have retrenched the one half of this, excepting, however, the part of the western side at the small porphyritical hill of Chapoltepec. We may well believe, however, that this hill was, some centuries before, also a small island, like the *Peñol* del *Marques*, or the *Peñol* de los Baños. It appears extremely probable, from geological observations, that the lakes had been on the decrease long before the arrival of the Spaniards, and before the construction of the canal of Huehuetoca.

* 9842 feet. *Trans.*

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The Aztecs, or Mexicans, before founding on a groupe of islands in 1325 the capital which yet subsists, had already inhabited for fifty-two years another part of the lake farther to the south, of which the Indians could never point out to me the site. The Mexicans left Aztlan towards the year 1160, and only arrived, after a migration of 56 years, in the valley of Tenochtitlan, by Malinalco, in the Cordillera of Toluca, and by Tula. They established themselves first at Zumpanco, then on the southern declivity of the mountains of Tepeyac, where the magnificent temple, dedicated to our lady of Guadaloupe, is situated. In the year 1245 (according to the chronology of the Abbe Clavigero), they arrived at Chapoltepec. Harassed by the petty princes of Zaltocan, whom the Spanish historians honour with the title of kings, the Aztecs, to preserve their independence, withdrew to a groupe of small islands called Acocolco, situated towards the southern extremity of the lake of Tezcuco. There they lived for half a century in great want, compelled to feed

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on roots of aquatic plants, insects, and a problematical reptile called *axolotl*, which Mr. Cuvier looks upon to be the nympha of an unknown salamander *. Having been reduced to slavery by the kings of Tezcuco or Acolhuacan, the Mexicans were forced to abandon their village in the midst of the lake, and to take refuge on the continent at Tizapan. The services which they rendered to their masters in a war against the inhabitants of Xochimilco again procured them liberty. They established themselves first at Acatzitzintlan, which they called Mexicalzingo, from the name of Mexitli, or Huitzilopochtli †,

* M. Cuvier has described in my *Recueil d'Observations Zoologiques et d'Anatome comparée*, p. 119. M. Dumeril believes that the axolotl, of which M. Bonpland and myself have brought individuals in good preservation, is a new species of proteus. *Zoologie Analytique*, p. 93.

† Huitzlin means humming-bird; and opochtli means left; for the god was painted with humming bird's feathers under the left foot. The Europeans have corrupted the word huitzilopochtli into huichilobos, and vizlipuzli. The brother of this

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their god of war, and next at Iztacalco. They removed from Iztacalco to the little islands which then appeared to the E.N.E. of the hill of Chapoltepec, in the western part of the lake of Tezcuco, in obedience to an order of the oracle of Aztlan. An ancient tradition was preserved among this horde, that the fatal term of their migration was to be a place where they should find an eagle sitting on the top of a nopal, of which the roots penetrated the crevices of a rock. This nopal (cactus), alluded to in the oracle, was seen by the Aztecs in the year 1325, which is the *second Calli** of the Mexican æra, on a small

god, who was much revered by the inhabitants of Tezcuco, was called Tlaca-huepan-Cuexcotzin.

* As the first *Acatl* corresponds to the year 1519, the *second Calli*, in the first half of the fourteenth century, can only be the year 1325, and not the years 1324, 1327, and 1341, which the translator of the *Raccolta di Mendoza*, as well as Siguenza, cited by Boturini, and Betencourt, cited by Torquemada, allege to have been the date of the foundation of Mexico. See the chronological dissertation of the Abbé Clavigero, *Storia di Messico*, T. IV. p. 54.

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island, which served for foundation to the Teocalli, or Teopan, *i. e.* the house of God, afterwards called by the Spaniards the Great Temple of Mexitli.

The first *Teocalli* around which the new city was built was of wood, like the most ancient Grecian temple, that of Apollo at Delphi, described by Pausanias. The stone edifice of which Cortez and Bernal Diaz admired the symmetry was constructed on the same spot by King Ahuitzotl in the year 1486. It was a pyramidal monument, of 37* metres in height, situated in the middle of a vast inclosure of walls, and consisted of five stories, like several pyramids of Sacara, and particularly that of *Mehedun*. The Teocalli of Tenochtitlan, very accurately laid out, like all the Egyptian, Asiatic, and Mexican pyramids, contained 97 metres† of base, and formed so truncated a pyramid, that when seen from a distance the monument appeared an enormous cube,

* 121 feet. *Trans.* † 318 feet. *Trans.*

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with small altars, covered with wooden cupolas on the top. The point where these cupolas terminated was 54 metres elevated above the base of the edifice or the pavement of the inclosure *. We may see from these details that the Teocalli bore a strong resemblance in form to the ancient monument of Babylon, called by Strabo the Mausoleum of Belus, which was only a pyramid dedicated to Jupiter Belus †. Neither the Teocalli nor the Babylonian edifice were temples in the sense which we attach to the word, according to the ideas derived by us from the Greeks and Romans. All edifices consecrated to Mexican divinities formed truncated pyramids. The great monuments of Teotihuacan, Cholula, and Papantla, still in preservation, confirm this idea, and indicate what the more inconsiderable temples were in the cities of Tenochtitlan aud Tezcuco. Covered altars were placed on the top of the Teocallis; and these edifices must hence be classed with the pyramidal

* 177 feet. *Trans.* † *Zoega de Obeliscis*, p. 50.

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monuments of Asia, of which traces were anciently found even in Arcadia; for the conical mausoleum of Callistus * was a true *tumulus*, covered with fruit trees, and served for base to a small temple consecrated to Diana.

We know not of what materials the Teocalli of Tenochtitlan was constructed. The historians merely relate, that it was covered with a hard and smooth stone. The enormous fragments which are from time to time discovered around the present cathedral are of porphyry, with a base of grünstein filled with amphibolos and vitreous feld-spath. When the square round the cathedral was recently paved, carved stones were found at a depth of ten and twelve metres †. Few nations have moved such great masses as were moved by the Mexicans. The calendar stone and the sacrifice stone, exposed to public view in the Great Square, contain from eight to ten cubic metres ‡.

* Pausanias, lib. viii. c. 35. † 32 and 38 feet. *Trans.*

‡ From 282 to 353 cubic feet. *Trans.*

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The colossal statue of Teoyaomiqui, covered with hieroglyphics, lying in one of the vestibules of the university, is * metres in length and three in breadth†. M. Gamboa, one of the canons, assured me, that on digging opposite the chapel of the Sagrario, a carved rock was found among an immense quantity of idols belonging to the Teocalli, which was seven metres in length, six in breadth, and three in height‡. They endeavoured in vain to remove it.

The Teocalli was in ruins § a few years after the

* The number in the original here, 2, is evidently erroneous. *Trans.*

† $9\frac{4}{5}$ feet. *Trans.*

‡ $22\frac{7}{8}$, $19\frac{3}{5}$, and $9\frac{4}{5}$ feet. *Trans.*

§ One of the oldest and most valuable manuscripts preserved at Mexico is the Book of the Municipality (*Libro del Cabildo*). Father Pichardo, a respectable *religioso* in the convent of San Felipe Neri, well versed in the history of his country, shewed me this manuscript, which was begun on the 8th March, 1524, three years after the siege. It speaks of the square where the great temple stood (*la plaza adonde estaba el templo major*).

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siege of Tenochtitlan, which, like that of Troy, ended in an almost entire destruction of the city. I am therefore inclined to believe that the exterior of the truncated pyramid was clay, covered with porous amygdaloid called *tetzontli*. In fact, a short time before the construction of the temple under the reign of King Ahuitzotl, the quarries of this cellular and spongy rock began to be worked. Now nothing could be easier destroyed than edifices constructed of porous and light materials, like pumice-stone. Notwithstanding the coincidence * of a great number of accounts, it is

* If those who have left us descriptions and plans of the Teocalli, instead of measuring it themselves, have merely related what they were told by the Indians, this coincidence proves less than might at first be believed. There are uniform traditions in every country as to the size of edifices, the height of towers, the breadth of crateres, and the descent of cataracts. National pride delights to exaggerate these dimensions, and travellers agree in their accounts so long as they draw from the same source. However, in this particular case the exaggeration of the height was not probably very

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not impossible that the dimensions attributed to the Teocalli are somewhat exaggerated; but the

great, because it was easy to judge of the elevation of the monument from the number of its steps.—*Author.*

So far from a coincidence in the accounts, it would appear from the Abbé Clavigero, whose zeal for the ancient honours of his country certainly by no means predisposed him to scepticism on such a subject, that there is almost no possibility of combining the different descriptions, or of ascertaining the dimensions from them. "Voremmo, che fosse stata altretanta la loro esatezza nelle misure, che ci lasciarono, quanto fu il loro zelo nel distruggere quel superbo monumento della superstizione; *ma è si grande la varieta con cui scrissero,* che dopo aver faticato nel combinare le lor descrizioni, *non ho potuto certificarmi delle misure,* nè avrei mai potuto formare idea dell' architettura di questo tempio, se non fosse stato per l'immagine, che ci presenta agli occhi il conquistatore anonimo, la cui copia noi diamo quì, benchè nelle misure ci conformiamo più colla sua relazione, che colla imagine."—(*Storia de Messico,* vol. ii. p. 26.)——This temple, of which the descriptions so much puzzled M. Clavigero, but which he ventures however to style *un superbo monumento della superstizione,* does not seem to have impressed Robertson with a very high idea of Mexican ingenuity.—"As far as one can gather," he says, "from their (the Spanish accounts) obscure and in-

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pyramidal form of this Mexican edifice, and its great analogy to the most ancient monuments of Asia, ought to interest us much more than its mass and size.

The old city of Mexico communicated with the continent by the three great dikes, of Tepejacac (Guadelupe), Tlacopan (Tacuba), and Iztapalapan. Cortez mentions four dikes, because he reckoned, without doubt, the causeway which led to Chapoltepec. The Calzada of Iztapalapan had a branch which united Coyohuacan to the small fort *Xaloc*, the same in which the Spaniards were entertained at their first entry by the Mexican nobility. Robertson speaks of a dike which led to Tezcuco, but such a dike never existed, on

accurate descriptions, the great temple of Mexico, the most famous of New Spain, was a solid mass of earth of a square form, faced partly with stone. Such structures convey no high idea of progress in art and ingenuity; and one can hardly conceive that a form more rude and simple could have occurred to a nation in its first efforts towards erecting any great work."—(Robertson's America, vol. iii. p. 317.) *Trans.*

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acoount of the distance of the place, and the great depth of the eastern part of the lake.

In 1338, seventeen years after the foundation of Tenochtitlan, a part of the inhabitants, in a civil dissension, separated from the rest: they established themselves in the small islands to the north-west of the temple of Mexitli. The new city, which at first bore the name of Xaltilolco, and afterwards Tlatelolco, was governed by a king independent of Tenochtitlan. In the centre of Anahuac, as well as in the Peloponesus, Latium, and wherever the civilization of the human species was merely commencing, every city, for a long time, constituted a separate state. The Mexican king Axajacatl* conquered Tlatelolco, which was thenceforth united by bridges to the city of Tenochtitlan. I discovered in the hieroglyphical manuscripts of the ancient Mexicans, preserved in the palace of the viceroy, a curious painting,

* *Clavigero*, i. p. 251. Axajacatl reigned from 1464 to 1477 (iv. p. 58.)

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which represents the last king of Tlatelolco, called Moquihuix, as killed on the top of a *house of God*, or truncated pyramid, and then thrown down the stairs which led to the stone of the sacrifices.—Since this catastrophe, the great market of the Mexicans, formerly held near the Teocalli of Mexitli, was transferred to Tlatelolco. The description of the Mexican market, which we have given from Cortez, relates to the market of Tlatelolco.

What is now called the Barrio of Santiago composes but a part of the ancient Tlatelolco. We proceed for more than an hour on the road to Tanepantla and Ahuahuetes, among the ruins of the old city. We perceive there, as well as on the road to Tacuba and Iztapalapan, how much the Mexico rebuilt by Cortez is smaller than Tenochtitlan under the last of the Montezumas. The enormous magnitude of the market-place of Tlatelolco, of which the boundaries are still discernible, proves the great population of the ancient city. The Indians show in this same market-

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place an elevation surrounded by walls. It was one of the Mexican theatres, the same on which Cortez, a few days before the end of the siege, erected his famous Catapulta (*trabuco de palo**), the appearance of which alone terrified the besieged; for the machine was incapable of being used from the awkwardness of the artillery-men. This elevation is now included in the porch of the chapel of Santiago.

The city of Tenochtitlan was divided into four quarters, called Teopan, or Xochimilca, Atzacualco, Moyotla, and Tlaguechiuchan, or Cuepopan. The old division is still preserved in the limits assigned to the quarters of St. Paul, St. Sebastian, St. John, and St. Mary; and the present streets have for the most part the same direction as the old ones, nearly from north to south, and from east to west†. But what gives the new city, as

* Lorenzana, p. 289.

† Properly from the S. 16° W. to N. 74° E. at least towards the convent of Saint Augustin, where I took my azimuths. The direction of the old streets was undoubtedly determined

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we have already observed, a peculiar and distinctive character, is, that it is situated entirely on the continent, between the extremities of the two lakes of Tezcuco and Xochimilco, and that it only receives, by means of navigable canals, the fresh water of the Xochimilco.

Many circumstances have contributed to this new order of things. The part of the salt-water lake between the southern and western dykes was always the shallowest. Cortez complained that his flotilla, the brigantines which he constructed at Tezcuco, could not, notwithstanding the openings in the dikes, make the circuit of the besieged city. Sheets of water of small depth became insensibly marshes, which, when intersected with trenches or small defluous canals, were converted into *chinampas* and arable land. The lake of Tezcuco,

by that of the principal dikes. Now, from the position of the places where these dikes appear to have terminated, it is very improbable that they represented exactly meridians and parallels.

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which Valmont de Bomare * supposed to communicate with the ocean, though it is at an elevation of 2,277 metres †, has no particular sources, like the lake of Chalco. When we consider, on the one hand, the small volume of water with which in dry seasons this lake is furnished by very inconsiderable rivers, and, on the other, the enormous rapidity of evaporation in the table-land of Mexico, of which I have made repeated experiments, we must admit, what geological observations appear also to confirm, that for centuries the want of equilibrium between the water lost by evaporation, and the mass of water flowing in, has progressively circumscribed the lake of Tezcuco within more narrow limits. We learn from the Mexican annals ‡, that in the reign of King Ahuizotl, this salt-water lake experienced such a want of water as to interrupt navigation; and that to

* *Dictionnaire d'Histoire Naturelle*, article *Lac.*

† 7468 feet. *Trans.*

‡ Paintings preserved in the Vatican, and testimony of Father Acosta.

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obviate this evil, and to increase its supplies, an aqueduct was constructed from Coyohuacan to Tenochtitlan. This aqueduct brought the sources of Huitzilopochco to several canals of the city which were dried up.

This diminution of water, experienced before the arrival of the Spaniards, would no doubt have been very slow and very insensible, if the hand of man, since the period of the conquest, had not contributed to reverse the order of nature. Those who have travelled in the peninsula know how much, even in Europe, the Spaniards hate all plantations which yield a shade round towns or villages. It would appear that the first conquerors wished the beautiful valley of Tenochtitlan to resemble the Castilian soil, which is dry and destitute of vegetation. Since the sixteenth century they have inconsiderately cut, not only the trees of the plain in which the capital is situated, but those on the mountains which surround it. The construction of the new city, begun in 1524, required a great quantity of timber for

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building and piles. They destroyed, and they daily destroy, without planting any thing in its stead, except around the capital, where the last viceroys have perpetuated their memory by promenades * (*Paseos, Alamedas*), which bear their names. The want of vegetation exposes the soil to the direct influence of the solar rays; and the humidity which is not lost by filtration through the amygdaloid, basaltic, and spongy rock, is rapidly evaporated and dissolved in air, wherever the foliage of the trees or a luxuriant verdure does not defend the soil from the influence of the sun and the dry winds of the south.

As the same cause operates throughout the whole valley, the abundance and circulation of water has sensibly diminished. The lake of Tezcuco, the finest of the five lakes, which Cortez in his letters habitually calls an interior *sea*, receives much less water from infiltration than in the sixteenth century. Every where the clearing

* *Paseo de Buccarelli, de Revillagigedo, de Galvez, de Asanza.*

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and destruction of forests have produced the same effects. General Andreossi, in his classical work on the Canal *du Midi*, has proved that the springs have diminished around the reservoir of St. Feneol, merely through a false system introduced in the management of the forests. In the province of Caraccas, the picturesque lake of Tacarigua* has been drying gradually up ever since the sun darted his rays without interposition on the naked and defenceless soil of the vallies of Aragua.

But the circumstance which has contributed the most to the diminution of the lake of Tezcuco is the famous open drain, known by the name of the *Desague real de Huehuetoca*, which we shall afterwards discuss. This *cut in the mountain*, first begun in 1607 in the form of a subterranean tunnel, has not only reduced within

* New islands appear in it from time to time from the diminution of water (*las aparecidas*).—The lake of *Tacarigua*, or *Nueva Valencia*, is 474 metres (1554 feet) elevated above the level of the sea.—(See my Tableaux de la Nature, tom. i. p. 72.

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very narrow limits the two lakes in the northern part of the valley, i. e. the lakes of Zumpango *(Tzompango)* and San Christobal; but has also prevented their waters in the rainy season from flowing into the basin of the lake of Tezcuco.—These waters formerly inundated the plains, and purified a soil strongly covered with carbonate and muriate of soda. At present, without settling into pools, and thereby increasing the humidity of the Mexican atmosphere, they are drawn off by an artificial canal into the river of Panuco, which flows into the Atlantic Ocean.

This state of things has been brought about from the desire of converting the ancient city of Mexico into a capital better adapted for carriages, and less exposed to the danger of inundation. The water and vegetation have in fact diminished with the same rapidity with which the tequesquite (or carbonate of soda) has increased. In the time of Montezuma, and long afterwards, the suburb of Tlatelolco, the *barios* of San Sebastian, San Juan, and Santa Cruz, were celebrated for the beautiful

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verdure of their gardens . but these places now, and especially the plains of San Lazaro, exhibit nothing but a crust of efflorescent salts. The fertility of the plain, though yet considerable in the southern part, is by no means what it was when the city was surrounded by the lake. A wise distribution of water, particularly by means of small canals of irrigation, might restore the ancientfertility of the soil, and re-enrich a valley which nature appears to have destined for the capital of a great empire.

The actual bounds of the lake of Tezcuco are not very well determined, the soil being so argillaceous and smooth that the difference of level for a mile is not more than two decimetres *. When the east winds blow with any violence, the water withdraws towards the western bank of the lake, and sometimes leaves an extent of more than 600 metres † dry. Perhaps the periodical operation of these winds suggested to Cortez the idea of re-

* 7.874 inches. *Trans.* † 1968 feet. *Trans.*

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gular tides*, of which the existence has not been confirmed by late observations. The lake of Tezcuco is in general only from three to five † metres in depth, and in some places even less than one. Hence the commerce of the inhabitants of the small town of Tezcuco suffers much in the very dry months of January and February; for the want of water prevents them from going in canoes to the capital. The lake of Xochimilco is free from this inconvenience; for from Chalco, Mesquic, and Tlahuac, the navigation is never once interrupted, and Mexico receives daily, by the canal of Iztapalapan, roots, fruits, and flowers in abundance.

Of the five lakes of the valley of Mexico, the lake of Tezcuco is most impregnated with muriate and carbonate of soda. The nitrate of barytes

* *Journal de Savans* for the year 1676, p. 34. The lake of Geneva manifests also a regular motion, which Saussure attributes to periodical winds.

† 9¼ to 16⅔ feet. *Trans.*

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proves that this water contains no sulphate in dissolution. The most pure and limpid water is that of the lake of Xochimilco, the specific weight of which I found to be 1.0009, when that of water distilled at the temperature of 18° centigrade * was 1.000, and when water from the lake of Tezcuco was 1.0215. The water of this last lake is consequently heavier than that of the Baltic sea, and not so heavy as that of the ocean, which, under different latitudes, has been found between 1.0269 and 1.0285. The quantity of sulphuretted hydrogen which is detached from the surface of all the Mexican lakes, and which the acetite of lead indicates in great abundance in the lakes of Tezcuco and Chalco, undoubtedly contributes in certain seasons to the unhealthiness of the air of the valley. However, and the fact is curious, intermittent fevers are very rare on the banks of these very lakes, of which the surface is partly concealed by rushes and aquatic herbs.

* 54° Fahrenheit. *Trans.*

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Adorned with numerous teocallis, like so many Mahometan steeples, surrounded with water and dikes, founded on islands covered with verdure, and receiving hourly in its streets thousands of boats which vivified the lake, the ancient Tenochtitlan, according to the accounts of the first conquerors, must have resembled some of the cities of Holland, China, or the Delta of Lower Egypt. The capital, reconstructed by the Spaniards, exhibits, perhaps, a less vivid, though a more august and majestic, appearance. Mexico is undoubtedly one of the finest cities ever built by Europeans in either hemisphere. With the exception of Petersburg, Berlin, Philadelphia, and some quarters of Westminster, there does not exist a city of the same extent which can be compared to the capital of New Spain, for the uniform level of the ground on which it stands, for the regularity and breadth of the streets, and the extent of the public places. The architecture is generally of a very pure style, and there are even edifices of very beautiful structure. The exterior of the houses is not loaded with

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ornaments. Two sorts of hewn stone, the porous amygdaloid called tetzontli, and especially a porphyry of vitreous feld-spath without any quartz, give to the Mexican buildings an air of solidity, and sometimes even magnificence. There are none of those wooden balconies and galleries to be seen which disfigure so much all the European cities in both the Indies. The balustrades and gates are all of Biscay iron, ornamented with bronze, and the houses, instead of roofs, have terraces like those in Italy and other southern countries.

Mexico has been very much embellished since the residence of the Abbé Chappe there in 1769. The edifice destined to the School of Mines, for which the richest individuals of the country furnished a sum of more than three millions of francs *, would adorn the principal places of Paris or London. Two great palaces *(hotels)* were recently constructed by Mexican artists, pupils of the Academy of Fine Arts of the capital. One of

* 124,800*l.* sterling. *Trans.*—See Chap. VIII.

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these palaces, in the quarter *della Traspana*, exhibits in the interior of the court a very beautiful oval peristyle of coupled columns. The traveller justly admires a vast circumference paved with porphyry flags, and inclosed with an iron railing, richly ornamented with bronze, containing an equestrian statue * of King Charles the Fourth, placed on a pedestal of Mexican marble, in the midst of the *Plaza Major* of Mexico, opposite the cathedral and the viceroy's palace. However, it must be agreed, that notwithstanding the progress of the arts within these last thirty years, it is much less from the grandeur and beauty of the monuments, than from the breadth and straightness of the streets,

* This colossal statue was executed at the expense of the Marquis de Branciforte, formerly viceroy of Mexico, brother-in-law of the Prince of Peace. It weighs 450 quintals, and was modelled, founded, and placed by the same artist, M. Tolsa, whose name deserves a distinguished place in the history of Spanish sculpture. The merits of this man of genius can only be appreciated by those who know the difficulties with which the execution of these great works of art are attended even in civilized Europe.

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and much less from its edifices than from its uniform regularity, its extent and position, that the capital of New Spain attracts the admiration of Europeans. From a singular concurrence of circumstances, I have seen successively, within a very short space of time, Lima, Mexico, Philadelphia, Washington *, Paris, Rome, Naples, and the largest cities of Germany. By comparing together impressions which follow in rapid succession, we

* From the plan of the city of Washington, and from the magnificence of its Capitol, of which I only saw a part completed, the *Federal City* will undoubtedly one day be a much finer city than Mexico. Philadelphia has also the same regularity of construction. The alleys of platanus, accacia, and populus heterophylla, which adorn its streets, almost give to it a rural beauty. The vegetation of the banks of the Putomac and Delaware is also richer than what we find at 2300 metres (7500 feet) of elevation on the ridge of the Mexican Cordilleras. But Washington and Philadelphia will always look like European cities. They will not strike the eyes of the traveller with that peculiar, I may say exotic, character which belongs to Mexico, Santa Fe de Bogota, Quito, and all the tropical capitals constructed at an elevation as high or higher than the passage of the Great St. Bernard.

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are enabled to rectify any opinion which we may have too easily adopted. Notwithstanding such unavoidable comparisons, of which several, one would think, must have proved disadvantageous for the capital of Mexico, it has left in me a recollection of grandeur which I principally attribute to the majestic character of its situation and the surrounding scenery.

In fact, nothing can present a more rich and varied appearance than the valley, when, in a fine summer morning, the sky without a cloud, and of that deep azure which is peculiar to the dry and rarefied air of high mountains, we transport ourselves to the top of one of the towers of the cathedral of Mexico, or ascend the hill of Chapoltepec. A beautiful vegetation surrounds this hill. Old cypress trunks *, of more than 15 and 16 metres † in circumference, raise their naked heads above those of the schinus, which resemble in

* Los Ahuahuetes.—Cupressus disticha Lin.

† 49 and 52 feet. *Trans.*

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their appearance the weeping willows of the east. From the centre of this solitude, the summit of the porphyritical rock of Chapoltepec, the eye sweeps over a vast plain of carefully cultivated fields, which extend to the very feet of the colossal mountains covered with perpetual snow. The city appears as if washed by the waters of the lake of Tezcuco, whose basin, surrounded with villages and hamlets, brings to mind the most beautiful lakes of the mountains of Switzerland. Large avenues of elms and poplars lead in every direction to the capital; and two aqueducts, constructed over arches of very great elevation, cross the plain, and exhibit an appearance equally agreeable and interesting. The magnificent convent of Nuestra Soñora de Guadalupe appears joined to the mountains of Tepeyacac, among ravines, which shelter a few date and young yucca trees. Towards the south, the whole tract between San Angel, Tacabaya, and San Augustin de las Cuevas, appears an immense garden of orange, peach, apple, cherry, and other European fruit trees. This

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beautiful cultivation forms a singular contrast with the wild appearance of the naked mountains which inclose the valley, among which the famous volcanos of La Puebla, Popocatepetl, and Iztaccihuatl are the most distinguished. The first of these forms an enormous cone, of which the crater, continually inflamed and throwing up smoke and ashes, opens in the midst of eternal snows.

The city of Mexico is also remarkable for its excellent police. The most part of the streets have very broad pavements; and they are clean and well lighted. These advantages are the fruits of the activity of the Count de Revillagigedo, who on his arrival found the capital extremely dirty.

Water is every where to be had in the soil of Mexico, a very short way below the surface, but it is brackish, like the water of the lake of Tezcuco. The two aqueducts already mentioned, by which the city receives fresh water, are monuments of modern construction worthy of the traveller's attention. The springs of potable water are situated to the east of the town, one in the insulated hill

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of Chapoltepec, and the other in the cerros of Santa Fe, near the Cordillera, which separates the valley of Tenochtitlan from that of Lerma and Toluca. The arches of the aqueduct of Chapoltepec occupy a length of more than 3300 metres *. The water of Chapoltepec enters by the southern part of the city, at the *Salto del Agua*. It is not the most pure, and is only drank in the suburbs of Mexico. The water which is least impregnated with carbonate of lime is that of the aqueduct of Santa Fe, which runs along Alameda, and terminates at la Traspana, at the bridge de la Marescala. This aqueduct is nearly 10200 metres † in length; but the declivity of the ground is such, that for not more than a third of this space the water can be conducted over arches. The old city of Tenochtitlan had aqueducts no less considerable ‡. In the beginning of the siege, the two captains Alvarado and Olid destroyed that

* 10,826 feet. *Trans.* † 33,464 feet. *Trans.*

‡ *Clavigero*, iii. p. 195; Solis, i. p. 406.

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of Chapoltepec. Cortez, in his first letter to Charles the Fifth, speaks also of the spring of Amilco, near Churubusco, of which the waters were brought to the city by pipes of burnt earth. This spring is near to that of Santa Fe. We still perceive the remains of this great aqueduct, which was constructed with double pipes, one of which received the water, while they were employed in cleaning the other*. This water was sold in canoes,

* *Lorenzana*, p. 108.—The largest and finest construction of the Indians in this way is the aqueduct of the city of Tezcuco. We still admire the traces of a great mound which was constructed to heighten the level of the water. How must we admire the industry and activity displayed in general by the ancient Mexicans and Peruvians in the irrigation of arid lands! In the maritime part of Peru I have seen the remains of walls, along which water was conducted for a space of from 5 to 6000 metres (from 16,404 to 19,685 feet), from the foot of the Cordillera to the coast. The conquerors of the 16th century destroyed these aqueducts, and that part of Peru is become, like Persia, a desert destitute of vegetation Such is the civilization carried by the Europeans among the people whom they are pleased to call barbarous.—*Author.*

How much it is to be regretted that Robertson gives usually

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which traversed the streets of Tenochtitlan. The sources of San Augustin de las Cuevas are the finest and purest; and I imagined I discovered on the road leading from this charming village to Mexico traces of an ancient aqueduct.

We have already named the three principal dikes by which the old city was connected with the terra firma. These dikes partly still exist, and the number has been even increased. They form at present great paved causeways across marshy grounds; and as they are very elevated, they possess the double advantage of admitting the passage of carriages, and containing the overflow-

such general descriptions, that we have a difficulty in forming any thing like a distinct conception of the subjects of them. He says of the Peru canals of irrigation, "By means of artificial canals, conducted with much patience and considerable art from the torrents that poured across their country, they conveyed a regular supply of moisture to their fields."—Would it have been beneath the dignity of a historian, to have specified that art and that patience to his readers for which he did not want materials?—*Trans.*

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ings of the lake. The Calzada of Astapalapan is founded on the very same old dike on which Cortez performed such prodigies of valour in his encounters with the besieged. The Calzada of San Anton is still distinguished in our days for the great number of small bridges which the Spaniards and Tlascaltecs found there, when Sandoval, Cortez's companion in arms, was wounded near Coyohuacan *. These Calzadas of San Antonio Abad, of La Piedad, of San Christobal, and of Guadalupe (anciently called the dike of Tepeyacac), were newly reconstructed after the great inundation of 1604, under the viceroy Don Juan de Mendoza y Lima, Marquis de Montesclaros. The only *savans* of that time, Fathers Torquemada and Geronimo de Zarate, executed the survey and marking out of the causeways. At this period the city of Mexico was paved for the first time; for before the Count de Revillagigedo, no other viceroy had employed himself more success-

* *Lorenzana*, p. 229, 243.

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fully in effecting a good police than the Marquis de Montesclaros.

The objects which generally attract the attention of the traveller are, 1. the *cathedral*, of which a small part is in the stile vulgarly called Gothic: the principal edifice, which has two towers ornamented with pilasters and statues, is of very beautiful symmetry and very recent construction. 2. The *treasury* adjoining to the palace of the viceroys, a building from which, since the beginning of the sixteenth century, more than 6500 millions * in gold and silver coin have been issued. 3. The *convents*, among which the great convent of St. Francis is particularly distinguished, which from alms alone possesses an annual revenue of half a million of francs †. This vast edifice was at first intended to be constructed on the ruins of the temple of Huitzilopochtli; but these ruins having been destined for the foundation of the cathedral, the convent was begun in 1531 in its actual situation. It owes

* 270,855,000*l.* sterling. *Trans.*

† 20,835*l.* sterling. *Trans.*

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its existence to the great activity of a serving brother or lay monk, Fray Pedro de Gante, an extraordinary man, who was said to have been the natural son of the Emperor Charles the Fifth, and who was a great benefactor of the Indians, to whom he was the first who taught the most useful mechanical arts of Europe. 4. The *hospital*, or rather the two united hospitals, of which the one maintains 600 and the other 800 children and old people. This establishment, in which both order and cleanliness may be seen, but little industry, has a revenue of 250,000 francs *. A rich merchant lately bequeathed to it by his testament six millions of francs †, which the royal treasury laid hold of, on the promise of paying five per cent. for it. 5. The *acordada*, a fine edifice, of which the prisons are generally spacious and well aired. They reckon in this house, and in the other prisons of the acordada which depend on it, more than 1200 individuals, among whom are a great number of

* 10,470*l.* sterling. *Trans.* † 250,020*l.* sterling. *Trans.*

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smugglers, and the unfortunate Indian prisoners, dragged to Mexico from the *provincias internas* (Indios Mecos), of whom we have already spoken in the 6th and 7th chapters. 6. *The School of Mines*, the newly begun edifice, and the old provisory establishment, with its fine collections in physics, mechanics, and mineralogy *. 7. *The botanical garden*, in one of the courts of the viceroy's palace. It is very small, but extremely rich in vegetable productions either rare or interesting for commerce. 8. The edifices *of the university and the public library*, which is very unworthy of so great and ancient an establishment. 9. *The Academy of Fine Arts*, with a collection of ancient casts. 10. *The equestrian statue of King Charles the*

* There are two other very remarkable oryctognostical and geological collections belonging to Professor Cervantes and the *Oidor* M. Caravajal. This respectable magistrate also possesses a superb cabinet of shells, collected during his residence in the Philippine Islands, where he displayed the same zeal for the physical sciences for which he is so honourably distinguished at Mexico.

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Fourth in the Plaza Mayor, and the sepulchral monument which the Duke de Monteleone consecrated to the great Cortez, in a chapel of the Hospital de los Naturales. It is a simple family monument, adorned with a bust in bronze, representing the hero in the prime of life, executed by M. Tolsa. Wherever we traverse Spanish America, from Buenos Ayres to Monterey, and from Trinidad and Portorico to Panamá and Veragua, we no where meet with a national monument erected by the public gratitude to the glory of Christopher Columbus and Hernan Cortez!

Those who are addicted to the study of history, and who love to investigate American antiquities, will not find in this capital those great remains of works which are to be seen in Peru, in the environs of Cusco and Guamachuco, at Pachacamac near Lima, or at Mansiche near Truxillo; at Cañar and Cayo in the province of Quito; and in Mexico, near Mitla and Cholula, in the intendancies of Oaxaca and Puebla. It appears that the teocallis (of which we have already attempted

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to describe the strange form) were the sole monuments of the Aztecs. Now the christian fanaticism was not only highly interested in their destruction, but the very safety of the conqueror rendered such a destruction necessary. It was partly effected during the siege; for those truncated pyramids rising up by layers served for refuge to the combatants, like the temple of Baal-Berith to the people of Canaan. They were so many castles from which it was necessary to dislodge the enemy.

As to the houses of individuals, which the Spanish historians describe as very low, we are not to be surprised to find merely their foundations or low ruins, such as we discover in the Bario de Tlatelolco, and towards the canal of Istacalco. Even in the most part of our European cities, how small is the number of houses of which the construction goes so far back as the beginning of the sixteenth century! However, the edifices of Mexico are not fallen into ruins through age: Animated by the same spirit of destruction which

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the Romans displayed at Syracuse, Carthage, and in Greece, the Spanish conquerors believed that the siege of a Mexican city never was finished till they had rased every building in it. Cortez, in his third letter* to the Emperor Charles V. discloses himself the fearful system which he followed in his military operations. "Notwithstanding all these advantages," says he, "which we have gained, I saw clearly that the inhabitants of the city of Temixtitlan (Tenochtitlan) were so rebellious and obstinate that they wished rather to perish than surrender. I knew not what means to employ to spare so many dangers and hardships, and to avoid completing the entire ruin of the capital, which was the most beautiful thing in the world *(a la ciudad, porque era la mas hermosa cosa del Mundo)*. It was in vain to tell them that I would never raise my camp, nor withdraw my flotilla of brigantines; and that I would never cease to carry on the war by land and

* Lorenzana, p. 278.

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water till I was master of Temixtitlan; and it was in vain I observed to them that they could expect no assistance, and that there was not a nook of land from which they could hope to draw maize, meat, fruits, and water. The more we made these exhortations to them, the more they showed us that they were far from being discouraged. They had no other desire but that of fighting. In this state of things, considering that more than forty or fifty days had already elapsed since we began to invest the place, I resolved at last to adopt means, by which, in providing for our own security, we should be able to press our enemies more closely. *I formed the design of demolishing on all sides all the houses in proportion as we became masters of the streets, so that we should not advance a foot without having destroyed and cleared down whatever was behind us, converting into firm ground whatever was water, however slow the operation might be; and notwithstanding the delay to which we should expose ourselves* *.

* Accordè de tomar un medio para nuestra seguridad y para poder mas estrechar a los enemigos; y fue que como

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For this purpose I assembled the lords and chiefs of our allies; and I explained to them the resolution which I had formed. I engaged them to send a great number of labourers with their *coas*, which are somewhat like the hoes which are used in Spain for excavations; and our allies and friends approved my project, for they hoped that the city would be laid in complete ruins, which they had ardently desired for a long time. Three or four days passed without fighting, for we waited the arrival of the people from the country, who were to aid us in demolishing."

After reading the naif recital of this commander-in-chief to his sovereign, we are not to be surprised at finding almost no vestige of the ancient Mexican edifices. Cortez relates that the Indians, to revenge themselves for the oppressions which

fuessemos ganando por las calles de la ciudad, que fuessen derocando todas las casas de ellas, de un lado y del otro; por manera que no fuessemos un passo adelante sin la dejar todo asolado y que lo que era agua hacerlo tierra firme; aunque hubiesse todo la dilacion que se pudiesse seguir.—Lorenzana, No. xxxiv.

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they had suffered from the Aztec kings, flocked in great numbers, even from the remotest provinces, whenever they learned that the destruction of the capital was going on. The rubbish of the demolished houses served to fill up the canals. The streets were made dry to allow the Spanish cavalry to act. The low houses, like those of Pekin and China, were partly constructed of wood and partly of tetzontli, a spongy stone, light, and easily broken. "More than fifty thousand Indians assisted us," says Cortez, "that day, when, marching over heaps of carcases, we at length gained the great street of Tacuba, and burned the house of King Guatimucin*. No

* The true name of this unfortunate king, the last of the Aztec dynasty, was *Quauhtemotzin*. He is the same to whom Cortez caused the soles of the feet to be gradually burned, after having soaked them in oil. This torment, however, did not induce the king to declare in what place his treasures were concealed. His end was the same as that of the king of Acolhuacan (Tezcuco), and of Tetlepanguetzaltzin, king of Tlacopan (Tacuba). These three princes were hung on the

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other thing, accordingly, was done than burn and demolish houses. Those of the city said to our

same tree, and as I saw in a hieroglyphical picture possessed by Father Pichardo (in the convent of San Felipe Neri), they were hung by the feet to lengthen out their torments. This act of cruelty in Cortez, which recent historians have the meanness to describe as the effect of a far-sighted policy, excited murmurs in the very army. "The death of the young king," says Bernal Diaz del Castillo (an old soldier full of honour and of naivety of expression), "was a very unjust thing. And it was accordingly blamed by us all, so long as we were in the suite of the captain, in his march to Comajahua."—*Author.*

The Abbe Clavigero observes, on what authority I know not, that this cruelty made Cortez very melancholy, and gave him a few sleepless nights, *una gran malinconia, ed alcune vegghie.* Well indeed it might; but whether we are indebted for these *vegghie* to the native suggestions of his own conscience, or to the murmurs of his army, is not so easy to be determined; for heroes consciences are made of stern stuff, as many can witness who have known several of them perform certain actions in a certain neighbouring country, and neither eat nor sleep the worse for it; at the bare recital of which other people's cheeks turn either pale or flushed as their different temperaments dispose them. We must not think that the Spaniards

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allies, that they did wrong in assisting us to destroy, because one day they would have to re-

monopolized cruelty in foreign settlements. Mr. Orme, in his excellent History of Hindostan, celebrates some feats of our own countrymen, and those the bravest of our countrymen, which yield very little to any thing in the Mexican annals. Three or four hundred, I believe, of the brave grenadiers who long distinguished themselves so gallantly on the plains of Trichinopoly, and who, rushing on certain destruction, swore, in their energetic way, "they would follow their leader to hell," on taking possession of a fortified town in Arcot put every soul in it to death, man, woman and child, for no other reason than that the place had been gallantly defended. Heroes are nearly the same all the world over.

But, to be sure, the poor Mexican kings were better off. Juan de Varillas, a friar of the order of Nuestra Señora de la Merced, confessed them, and comforted them in their sufferings, that they were good christians, and that they died in good preparation, seeing they were baptized: *li confessò e confortò nel supplicio: ch'eglino erano buoni Cristiani, e che morirono ben disposti: ond' è manifesto ch' erano stato battezzati.* (Clavigero, iii. p. 233. Note.)

It is only after considering the operations of an army in detail, and the ferocious dispositions and habits of those of which it is almost necessarily, for the greatest part, composed, that we can fully appreciate all the glory of a Cornwallis, an

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construct with their hands the very same edifices, either for the besieged if they were to conquer, or for us Spaniards, who, in reality, now compel them to rebuild what was demolished."*. In going over the Libro del Cabildo, a manuscript already mentioned by us, which contains the history of the new city of Mexico from the year 1524 to 1529, I found nothing in all the pages but names of people who appeared before the alguazils "to demand the situation (*solar*) on which formerly stood the house of such or such a Mexican lord." Even at present they are occupied in filling and drying up the old canals which run through the capital. The number of these canals has diminished in a particular manner since the govern-

Abercromby, or a Moore. This is not dictated in the spirit of a canting philosophy, nor from a foolish imagination that soldiers will ever be other than what they are. No one would wish to see them imbued with the lacrymose propensities of a modern hero of romance. It is perhaps wisely ordained, that those who fight should not be those who feel.—*Trans.*

* Lorenzana, p. 286.

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ment of the Count de Galvez, though on account of the great breadth of the streets of Mexico, the canals are less inimical to the passage of carriages than in the most part of the cities of Holland.

We may reckon among the small remains of Mexican antiquities which interest the intelligent traveller, either in the bounds of the city of Mexico, or in its environs, the ruins of the Aztec dikes (albarradones) and aqueducts; the stone of the sacrifices, adorned with a relievo which represents the triumph of a Mexican king; the great calendar monument (exposed with the foregoing at the Plaza mayor;) the colossal statue of the goddess Teoyaomiqui, stretched out in one of the galleries of the edifice of the university, and habitually covered with three or four inches of earth; the Aztec manuscripts, or hieroglyphical pictures, painted on agave paper, on stag skins and cotton-cloth, (a valuable collection unjustly taken away from the Chevalier Boturini*, very ill preserved

* The author of the ingenious work, Ydea de una nueva

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in the archives of the palace of the viceroys, displaying in every figure the extravagant imagination of a people who delighted to see the palpitating heart of human victims offered up to gigantic and monstrous idols); the foundations of the palace of the kings of Alcolhuacan at Tezcuco; the colossal relievo traced on the western face of the porphyritical rock called the Peñol de los Baños; as well as several other objects which recall to the intelligent observer the institutions and works of people of the Mongol race, of which descriptions and drawings will be given in the historical account of my travels to the equinoxial regions of the new continent.

The only ancient monuments in the Mexican valley which from their size or their mas es can strike the eyes of an European are the remains of

Historia general de la America Septentrional por el Caballero Boturini. *Author.*

Robertson gives a character of this book somewhat lower; "His idea of a new history appears to me the work of a whimsical credulous man." Vol. iii. note 36. *Trans.*

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the two pyramids of San Juan de Teotihuacan, situated to the north-east of the lake of Tezcuco, consecrated to the sun and moon, which the Indians called Tonatiuh Ytzaqual, house of the sun, and Metzli Ytzaqual, house of the moon. According to the measurements made in 1803 by a young Mexican savant, Doctor Oteyza, the first pyramid, which is the most southern, has in its present state a base of 208 metres* (645 feet) in length, and 55 metres (66 Mexican vara†, or 171 feet ‡) of perpendicular elevation. The second, the pyramid of the moon, is eleven metres‖ (30 feet) lower, and its base is much less. These monuments, according to the accounts of the first travellers, and from the form which they yet

* 682 feet English. *Trans.*

† Velasquez found that the Mexican vara contained exactly 31 inches of the old pied du roi of Paris. The northern façade of the Hotel des Invalides at Paris is only 600 feet French in length.

‡ 180 feet English. *Trans.*

‖ 36 feet English. *Trans.*

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exhibit, were the models of the Aztec teocallis. The nations whom the Spaniards found settled in New Spain attributed the pyramids of Teotihuacan to the Toultec nation*; consequently their construction goes as far back as the eighth or ninth century; for the kingdom of Tolula lasted from 667 to 1031. The faces of these edifices are to within 52′ exactly placed from north to south, and from east to west. Their interior is clay, mixed with small stones. This kernel is covered with a thick wall of porous amygdaloid. We perceive, besides, traces of a bed of lime which covers the stones (the tetzontli) on the outside.

* Siguenza, however, in his manuscript notes, believes them to be the work of the Olmec nation, which dwelt round the Sierra de Tlascala, called Matlacueje. If this hypothesis, of which we are unacquainted with the historical foundations, be true, these monuments would be still more ancient. For the Olmecs belong to the first nations mentioned in the Aztec chronology as existing in New Spain. It is even pretended that the Olmecs are the only nation of which the migration took place, not from the north and north-west (Mongol Asia?), but from the east (Europe?).

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Several authors of the sixteenth century pretend, according to an Indian tradition, that the interior of these pyramids is hollow. Boturini says that Siguenza, the Mexican geometrician, in vain endeavoured to pierce these edifices by a gallery. They formed four layers, of which three are only now perceivable, the injuries of time and the vegetation of the cactus and agaves having exercised their destructive influence on the exterior of these monuments. A stair of large hewn stones formerly led to their tops, where, according to the accounts of the first travellers, were statues covered with very thin lamina of gold. Each of the four principal layers was subdivided into small gradations of a metre *, in height, of which the edges are still distinguishable, which were covered with fragments of obsidian, that were undoubtedly the edge instruments with which the Toultec and Aztec priests in their barbarous sacrifices (*Papa'tua Temacazque or Teopixqui*) opened the chest of the human victims. We know that the obsidian

* 3 feet 3 inches. *Trans.*

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(itztli) was the object of the great mining undertakings, of which we still see the traces in an innumerable quantity of pits between the mines of Moran and the village of Atotonilco el Grande, in the porphyry mountains of Oyamel and the Jacal, a region called by the Spaniards the mountain of knives, el Cerro de las Navajas *.

It would be undoubtedly desirable to have the question resolved, whether these curious edifices, of which the one (*the Tonatiuh Ytzaqual*), according to the accurate measurement of my friend M. Oteyza, has a mass of 128,970 cubic toises†, were entirely constructed by the hand of man, or whether the Toultecs took advantage of some natural hill which they covered over with stone and lime. This very question has been recently agitated with respect to several pyramids of Giza

* I found the height of the summit of the Jacal 3124 metres (10,248 feet); and la Rocca de las Ventanas, at the foot of the Cerro de las Navajas, 2590 metres (8496 feet) above the level of the sea.

† 33,743,201 cubic feet. *Trans.*

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and Sacara; and it has become doubly interesting from the fantastical hypotheses which M. Witte has thrown out as to the origin of the monuments of colossal form in Egypt, Persepolis, and Palmyra. As neither the pyramids of Teotihuacan, nor that of Cholula, of which we shall afterwards have occasion to speak, have been diametrically pierced, it is impossible to speak with certainty of their interior structure. The Indian traditions, from which they are believed to be hollow, are vague and contradictory. Their situation in plains where no other hill is to be found renders it extremely probable that no natural rock serves for a kernel to these monuments. What is also very remarkable (especially if we call to mind the assertions of Pococke, as to the symmetrical position of the lesser pyramids of Egypt) is, that around the houses of the son and moon of Teotihuacan we find a groupe, I may say a system, of pyramids, of scarcely nine or ten metres of elevation*. These monuments, of which there are

* 29 or 32 feet. *Trans.*

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several hundreds, are disposed in very large streets which follow exactly the direction of the parallels, and of the meridians, and which terminate in the four faces of the two great pyramids. The lesser pyramids are more frequent towards the southern side of the temple of the moon than towards the temple of the sun: and, according to the tradition of the country, they were dedicated to the stars. It appears certain enough that they served as burying places for the chiefs of tribes. All the plain which the Spaniards, from a word of the language of the island of Cuba, call *Llano de los Cues*, bore formerly in the Aztec and Toultec languages the name of *Micaotl*, or road of the dead. What analogies with the monuments of the old continent! And this Toultec people, who, on arriving in the seventh century on the Mexican soil, constructed on a uniform plan several of those colossal monuments, those truncated pyramids divided by layers, like the temple of Belus at Babylon, whence did they take the model of these edifices? Were they of Mongol race? Did they

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descend from a common stock* with the Chinese, the Hiong-nu, and the Japanese?

Another ancient monument, worthy of the traveller's attention, is the military entrenchment of Xochicalco, situated to the S.S.W. of the town of Cuernavaca, near Tetlama, belonging to the parish of Xochitepeque. It is an insulated hill of 117 metres of elevation, surrounded with ditches or trenches, and divided by the hand of man into five terraces covered with masonry. The whole forms a truncated pyramid, of which the four faces are exactly laid down according to the four cardinal points. The porphyry stones with basaltic bases are of a very regular cut, and are adorned with hieroglyphical figures, among which are to be seen crocodiles spouting up water, and,

* See a work of Mr. Herders: Idea of a philosophical History of the Human Species, Vol. II. page 11, (in German), and Essay towards a Universal History by M. Gatterer, p. 489, (in German).

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what is very curious, men sitting cross legged in the Asiatic manner. The platform of this extraordinary monument* contains more than 9000 square metres †, and exhibits the ruins of a small square edifice, which undoubtedly served for a last retreat to the besieged.

I shall conclude this rapid view of the Aztec antiquities with pointing out a few places which may be called classical, on account of the interest they excite in those who have studied the history of the Spanish conquest of Mexico.

The palace of Motezuma occupied the very same site on which at present stands the hotel of the Duke de Monteleone, vulgarly called Casa del Estado, in the Plaza Mayor, S. W. from the

* Descripcion de las antiguedades de Xochicalco dedicada a los Señores de la Expedicion maritima baxo las ordenes de Don Alexandro Malaspina por Don Jose Antonio Alzate. Mexico, 1791, p. 12.

† 96,825 square feet. *Trans.*

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cathedral. This palace, like those of the Emperor of China, of which we have accurate descriptions from Sir George Staunton and M. Barrow, was composed of a great number of spacious but very low houses. They occupied the whole extent of ground between the Empedradillo, the great street of Tacuba, and the convent de la Professa. Cortez, after the taking of the city, fixed his abode opposite to the ruins of the palace of the Aztec kings, where the palace of the viceroy is now situated. But it was soon thought that the house of Cortez was more suitable for the assemblies of the audiencia, and the government consequently made the family of Cortez resign the Casa del Estado, or the old hotel belonging to them. This family, which bears the title of the *Marquesado del Valle de Oaxaca*, received in exchange the situation of the ancient palace of Montezuma, and they there constructed the fine edifice in which the archives del Estado are kept, and which descended with the rest of the heritage to the Neapolitan Duke de Monteleone.

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At the first entry of Cortez into Tenochtitlan on the 8th November, 1519, he and his small army were lodged not in the palace of Motezuma, but in an edifice formerly possessed by king Axajacatl. It was in this edifice that the Spaniards and the Tlascaltecs, their allies, sustained the assault of the Mexicans; it was there that the unfortunate king Motezuma* perished of the consequences of a wound which he received in haranguing his people. We still perceive†

* It is from one of his sons, called *Tohualicahuatzin*, and after baptism *Don Pedro Motezuma*, that the Counts of Motezuma and Tula in Spain are descended The Cano Motezuma, the Andrade Motezuma, and, if I am not mistaken, even the counts of Miravalle at Mexico, trace back their origin to the beautiful princess *Tecuichpotzin*, the youngest daughter of the last King Motezuma II., or *Motecuzoma Xocojotzin*. The descendants of this king did not mingle their blood with the whites till the second generation.

† The proofs of this assertion are contained in the manuscripts of M. Gama, at the convent of San Felippe Neri, in the hands of Father Pichardo. The palace of Axajacatl was probably a vast inclosure, which contained several edifices; for

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inconsiderable remains of these quarters of the Spaniards in the ruins behind the convent of Santa Teresa, at the corner of the streets of Tacuba and del Indio Triste.

A small bridge near Bonavista preserves the name of Alvarado's Leap (Salto de Alvarado), in memory of the prodigious leap of the valorous Don Pedro de Alvarado, when in the famous *melancholy night**, the dike of Tlacopan having been cut in several places by the Mexicans, the Spaniards withdrew from the city to the mountains of Tepeyacac. It appears that even in the time of Cortez the historical truth of this fact was disputed, which, from popular tradition, is familiar to every class of the inhabitants of Mexico. Bernal Diaz considers the history of the

nearly seven thousand men were quartered there. (Clavigero, iii. p. 79). The ruins of the city of Mansiche in Peru give us a clear idea of this species of American construction. Every habitation of a great lord formed a separate district, in which the courts, streets, walls, and ditches were distinguished.

* *Noche triste*, July 1, 1520.

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leap as a mere boast of his companion in arms, of whose courage and presence of mind he, however, elsewhere makes honourable mention. He affirms that the ditch was much too broad to be passed at a leap. I have, however, to observe, that this anecdote is very minutely related in the manuscript of a noble Mestizoe of the republic of Tlascala, Diego Muñoz Camargo, which I consulted at the convent of San Felipe Neri, and of which Father Torquemada * appears also to have

* *Monarquia Indiana*, Lib. iv. cap. 80. *Clavigero*, i. p. 10. There still exist in Mexico and Spain several historical manuscripts of the 16th century, of which the publication by extract would throw much light on the history of Anahuac. Such are the manuscripts of Sahagun, Motolinia, Andrea de Olmos, Zurita, Josef Tobar, Fernando Pimentel Ixtlilxochitl, Antonio Motezuma, Antonio Pimentl Ixtlilxochitl, Taddeo de Niza, Gabriel d'Ayala, Zapata, Ponce, Christophe de Castillo, Fernando Alba Ixtlilxochitl, Pomar, Chimalpain, Alvarado Tezozomoc, and Gutteriez. All these authors, with the exception of the five first, were baptized Indians, natives of Tlascala, Tezcuco, Cholula, and Mexico. The Ixtlilxochitls descended from the royal family of Alcohuacan.

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had some knowledge. This Mestizoe historian was the contemporary of Hernan Cortez. He relates the history of Alvarado's leap with much simplicity, without any appearance of exaggeration, and without mentioning the breadth of the ditch. We imagine we perceive in his naive recital one of the heroes of antiquity, who, with his shoulder and arm supported on his lance, takes an enormous leap to escape from the hands of his enemies. Camargo adds, that other Spaniards wished to follow the example of Alvarado, but that, having less agility than he had, they fell into the ditch *(azequia)*. The Mexicans, says he, were so astonished at the address of Alvarado, that on seeing him make his escape, they bit the earth (a figurative expression which the Tlascaltec author borrowed from his language, and which signifies being stupified with admiration *). "The

* There is such a thing, perhaps, as explaining too much. Few of M. Humboldt's readers, I dare say, will be led to conceive that the Mexicans fell literally to the eating of earth. There are bounds to commenting, which a salutary dread of

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children of Alvarado, who was called the *Capitan del Salto*, proved by witnesses before the judges of Tezcuco the prowess of their father. To this they were compelled by a process in which they demonstrated the exploits of *Alvarado de el Salto*, their father, at the period of the conquest of Mexico."

Strangers are shown the bridge of Clerigo, near the Plaza Mayor de Tlatelolco, as the memorable place where the last Aztec king Quauhtemotzin, nephew of his predecessor King Cuitlahuatzin*, and son-in-law of Motezuma II., was taken. But

prolixity should impress on every writer, but which, unfortunately, the countrymen of M. de Humboldt (Germans) seem seldom to have a clear conception of. I shall make myself sufficiently understood when I allude to the prolixity of their most celebrated writers, their Herders, Gentzes, and Wielands. *Trans.*

* This king Cuitlahuatzin (whom Solis and the other European historians, who confound all the Mexican names, call Quetlabaca) was the brother and successor of Motezuma II. He is the same prince who displayed so much taste for gardening; and who, according to the recital of Cortez, made

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the result of the most careful researches which myself and Father Pichardo could make was, that the young king fell into the hands of Garci Holguin *, in a great basin of water which was formerly between the Garita del Peralvillo, the square of Santiago de Tlatelolco, and the bridge of Amaxac. Cortez happened to be on the terrace of a house of Tlatelolco, when the young king was brought a prisoner to him. "I made him sit down," says the conqueror in his third letter to the Emperor Charles V., "and I treated him with confidence; but the young man put his hand on the poniard which I wore at my side, and exhorted me to kill him, because, since he had done all that his duty to himself and his people demanded of him, he had no other desire but

the collection of rare plants, which were long admired after his death, at Iztapalapan.

* On the 31st August, 1521, the 75th day of the siege of Tenochtitlan, and Saint Hyppolitus's day. The same day is still celebrated every year by a tour round the city by the viceroy and *oidores* on horseback, following the standard.

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death." This trait is worthy of the best days of Greece and Rome. Under every zone, and whatever be the colour of men, the language of energetic minds struggling with misfortune is the same. We have already seen what was the tragical end of this unfortunate Quauhtemotzin.

After the entire destruction of the ancient Tenochtitlan, Cortez remained with his people for four or five months at Cojohuacan*, a place for which he constantly displayed a great predilection. He was at first uncertain whether he should reconstruct the capital on some other spot around the lakes. He at last determined on the old situation, "because the city of Temixtitlan had acquired celebrity, because its position was delightful, and because in all times it had been considered as the head of the Mexican provinces," (como principal y señora *de todas estas provincias.*) It cannot, however, admit of a doubt, that, on account of the frequent inundations suffered by Old and

* Lorenzana, p. 307.

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New Mexico, it would have been better to have rebuilt the city to the east of Tezcuco, or on the heights between Tacuba and Tacubaya*. The capital was, in fact, about to be transferred to these heights by a formal edict of King Philip III., at the period of the great inundation in 1607. The *ajuntamiento*, or magistracy of the city, represented to the court that the value of the

* *Cisneros descripcion del sitio en el qual se halla Mexico. Alzate Topographia de Mexico,* (Gazetta de Litteratura, 1790, p. 32). The most part of the great cities of the Spanish colonies, however new their appearance may be, are in disagreeable situations. I do not here speak of the site of Caraccas, Quito, Pasto, and several other cities of South America, but merely of the Mexican cities; for example, Valladolid, which might have been built in the beautiful valley of Tepare; Guadalaxara, which is quite near the delightful plain of the Rio Chiconahuatenco, or San Pedro; Pazcuaro, which we cannot help wishing to have been built at Tzintzontza. One would say that every where the new colonists of two adjoining places have uniformly chosen either the one most mountainous, or most exposed to inundations. But indeed the Spaniards have constructed almost no new cities; they merely inhabited or enlarged those which were already founded by the Indians.

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houses condemned to destruction amounted to 105 millions of francs *. They appeared to be ignorant at Madrid that the capital of a kingdom, constructed for more than 88 years, is not a flying camp, which may be changed at will.

It is impossible to determine with any certainty the number of inhabitants of old Tenochtitlan. Were we to judge from the fragments of ruined houses, and the recital of the first conquerors, and especially from the number of the combatants whom the kings Cuitlahuatzin and Quauhtimotzin opposed to the Tlascaltecs and Spaniards, we should pronounce the population of Tenochtitlan three times greater than that of Mexico in our days. Cortez asserts, that after the siege the concourse of Mexican artisans who wrought for the Spaniards, as carpenters, masons, weavers, and founders, was so enormous, that in 1524 the new city of Mexico already numbered thirty thousand inhabitants. Modern authors have thrown out the

* 4,375,350*l.* sterling. *Trans.*

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most contradictory ideas regarding the population of this capital. The Abbe Clavigero, in his excellent work on the ancient history of New Spain, proves that these estimations vary from sixty thousand to a million and a half of inhabitants *. We ought not to be astonished at these contradictions when we consider how new statistical researches are even in the most cultivated parts of Europe.

According to the most recent and least uncertain data, the actual population of the capital of Mexico appears to be (including the troops) from 135 to 140,000 souls. The enumeration in 1790, by orders of the Count de Revillagigedo, gave a result† of only 112,926 inhabitants for the city; but we know that this result is one-sixth below the truth. The regular troops and militia in garrison in the capital are composed of from 5 to

* *Clavigero*, iv. p. 278. note *p*.

† See note C. at the end of the work.

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6000 men in arms. We may admit with great probability that the actual population consists of

2,500 white Europeans.
65,000 white Creoles.
33,000 indigenous (copper-coloured).
26,500 Mestizoes, mixture of whites and Indians.
10,000 Mulattoes.

137,000 inhabitants.

There are consequently in Mexico 69,500 men of colour, and 67,500 whites; but a great number of the Mestizoes are almost as white as the Europeans and Spanish Creoles!

In the twenty-three male convents which the capital contains there are nearly 1200 individuals, of whom 580 are priests and choristers. In the fifteen female convents there are 2100 individuals, of whom nearly 900 are professed *religieuses*.

The clergy of the city of Mexico is extremely

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numerous, though less numerous by one-fourth than at Madrid. The enumeration of 1790 gives

		Individuals.
In the convents of monks.	573 priests and choristers.	867
	59 novices.	
	235 lay brothers.	
In the convents of nuns.	888 professed religieuses.	923
	35 novices.	
Prebendaries		26
Parish priests *(curés)*.		16
Curates		43
Secular ecclesiastics		517
	Total	2,392

and without including lay brothers and novices 2,068. The clergy of Madrid, according to the excellent work of M. de Laborde*, is composed

* This *excellent work* of Laborde, it is worth while to remark, received several contributions from M. de Humboldt. *Trans.*

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of 3470 persons, consequently the clergy is to the whole population of Mexico as $1\frac{1}{2}$ to 100, and at Madrid as 2 to 100.

We have already given a view of the revenues of the Mexican clergy. The archbishop of Mexico possesses a revenue of 682,500 livres*. This sum is somewhat less than the revenue of the convent of Jeronimites of the Escurial. An archbishop of Mexico is, consequently, much poorer than the archbishops of Toledo, Valencia, Seville, and Santiago. The first of these possesses a revenue of three millions of livres †. However M. de Laborde has proved, and the fact is by no means generally known, that the clergy of France before the revolution was more numerous, compared to the total population, and richer as a body, than the Spanish clergy. The revenues of the tribunal of inquisition of Mexico, a tribunal which extends over the whole kingdom of New Spain,

* 18,420*l.* sterling. *Trans.* † 125,000*l.* sterling. *Trans.*

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Guatimala, and the Philippine Islands, amount to 200,000 livres*.

The number of births at Mexico, for a mean term of 100 years, is 5,930; and the number of deaths 5050. In the year 1802 there were even 6,155 births and 5,166 deaths, which would give, supposing a population of 137,000 souls, for every $22\frac{1}{2}$ individuals, one birth, and for every $26\frac{1}{2}$ one death. We have already seen in the fourth chapter, that in the country they reckon in general in New Spain the relation of the births to the population† as one to 17; and the relation of the deaths to the population as one to 30. There is consequently, in appearance, a very great mortality

* 8334*l.* sterling. *Trans.*

† In France the relation of the births to the deaths is such, that on the totality of the population only one 30th annually dies, while there is born one 28th. *Peuchet* Statistique, *p.* 251. In cities this proportion depends on a concurrence of local and variable circumstances. In 1786 there were reckoned in London 18,119 births, and 20,454 deaths; and in 1802, at Paris 21,818 births, and 20,390 deaths.

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and a very small number of births in the capital. The conflux of patients to the city is considerable, not only of the most indigent class of the people who seek assistance in the hospitals, of which the number of beds amounts to 1100, but also of persons in easy circumstances, who are brought to Mexico because neither advice nor remedies can be procured in the country. This circumstance accounts for the great number of deaths on the parish registers. On the other hand, the convents, the celibacy of the secular clergy*, the progress of luxury, the militia, and the indigence of the Saragates Indians, who live like the Lazaroni of Naples in idleness, are the principal causes which influence the disadvantageous relation of the births to the population.

* From this mode of expression one would be led to imagine that the regular clergy did not live in celibacy. What they may contribute to the population more than the secular clergy will not be easy to ascertain, but their title is presumed to be precisely the same. *Trans.*

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MM. Alzate and Clavigero*, from a comparison of the parish registers of Mexico with those of several European cities, have endeavoured to prove that the capital of New Spain must contain more than 200,000 inhabitants; but how can we suppose in the enumeration of 1790 an error of 87,000 souls, more than two-fifths of the whole population? Besides, the comparisons of these two learned Mexicans can from their nature lead to no certain results, because the cities of which they exhibit the bills of mortality are situated in very different elevations and climates, and because the state of civilization and comfort of the great mass of their inhabitants afford the most striking

* The Abbé Clavigero falls into an error when he says "that an enumeration gave more than 200,000 souls to the city of Mexico." He says, however, very truly, that the births and deaths of Mexico generally amount to a fourth more than those of Madrid. In fact, in 1788 the number of births at Madrid was 4897, and the deaths 5915; and in 1797 there were 4441 deaths and 4911 births. (*Alexandre de Laborde*, ii. p. 102).

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contrasts. At Madrid the births are one in 34, and at Berlin one in 28. The one of these proportions can no more, however, than the other be applicable to calculations regarding the population of the cities of equinoxial America. Yet the difference between these proportions is so great, that it would alone, on an annual number of 6000 births, augment or diminish to the extent of 36,000 souls the population of the city of Mexico. The number of deaths or births is, perhaps, the best of all means for determining the number of the inhabitants of a district, when the numbers which express the relations of the births and deaths to the whole population *in a given country* have been carefully ascertained; but these numbers, the result of a long induction, can never be applied to countries whose physical and moral situation are totally different. They denote the medium state of prosperity of a mass of population, of which the greatest part dwell in the country; and we cannot, therefore, avail ourselves of these proportions to ascertain the number of inhabitants of a capital.

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Mexico is the most populous city of the new continent. It contains nearly 40,000 inhabitants fewer than Madrid*; and as it forms a great square of which each side is nearly 2750 metres †, its population is spread over a great extent of ground. The streets being very spacious, they in general appear rather deserted. They are so much the more so, as in a climate considered as cold by the inhabitants of the tropics, people expose themselves less to the free air than in the cities at the foot of the Cordillera. Hence the latter (*ciudades de tierra caliente*) appear uniformly more populous than the cities of the temperate or cold regions (*ciudades de tierra fria*). If Mexico contains more inhabitants than any of the cities of Great

* The population of Madrid (says M. de Laborde), is "156,272 inhabitants. However with the garrison, strangers and Spaniards who flock in from the provinces, the population may be carried to 200,000 souls." The greatest length of Mexico is nearly 3900 metres (12,794 English feet); of Paris 8000 metres (26,246 English feet).

† 9021 feet. *Trans.*

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Britain and France, with the exception of London, Dublin, and Paris; on the other hand, its population is much less than that of the great cities of the Levant and East-Indies.—Calcutta, Surat, Madras, Aleppo, and Damascus, contain all of them from two to four and even six hundred thousand inhabitants.

The Count de Revillagigedo set on foot accurate researches into the consumption of Mexico. The following table, drawn up in 1791, may be interesting to those who have a knowledge of the important operations of MM. Lavoisier and Arnould, relative to the consumption of Paris and all France.

CONSUMPTION OF MEXICO.

I. EATABLES.

Beeves . .	16,300
Calves . .	450
Sheep . .	278,923
Hogs . .	50,676
Kids and rabbits .	24,000

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Fowls	1,255,340
Ducks	125,000
Turkies	205,000
Pigeons	65,300
Partridges	140,000

II. GRAIN.

Maize or Turkey wheat, cargas of three fanegas	117,224
Barley, cargas	40,219

III. LIQUIDS.

Wheat flour, cargas of 12 arrobas*	130,000
Pulque, the fermented juice of the agava, cargas	294,790
Wine and vinegar, barrels of 4½ arrobas	4,507

* Flour is not certainly a liquid; but it is probably classed among the liquids, as being sold by liquid measure. *Trans.*

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Brandy, barrels	12,000
Spanish oil, arrobas of 25 pounds	5,585

Supposing, with M. Peuchet, the population of Paris to be four times greater than that of Mexico, we shall find that the consumption of beef is nearly proportional to the number of inhabitants of the two cities, but that that of mutton and pork is infinitely more at Mexico. The difference is as follows:

	Consumption		Quadruple of the Consumption of Mexico.
	Of Mexico.	Of Paris.	
Beeves	16,300	70,000	65,200
Sheep	273,000	350,000	1,110,000
Hogs	50,100	35,000	200,400

M. Lavoisier found by his calculations that the inhabitants of Paris cousumed annually in his time 90 millions of pounds, of animal food of all sorts,

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which amounts to 163 pounds* ($79\frac{7}{10}$ kilogrammes) per individual. In estimating the animal food yielded by the animals designated in the preceding table, according to the principles of Lavoisier, modified according to the localities, the consumption of Mexico in every sort of meat is 26 millions of pounds, or 189 pounds ($\frac{4}{10}$ kilogrammes)† per individual. This difference is so much the more remarkable as the population of Mexico includes 33,000 Indians, who consume very little animal food.

The consumption of wine has greatly increased since 1791, especially since the introduction of the Brownonian system in the practice of the Mexican physicians. The enthusiasm with which this system was received in a country where asthenical or debilitating remedies had been employed to an excess for ages, produced, accord-

* $175\frac{9}{10}$lb. averd. *Trans.*

† 204lb. averd. The author has omitted to insert the integral number of kilogrammes. I have merely converted the French pounds into averdupois, and left the error of the text as I found it. *Trans.*

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ing to the testimony of all the merchants of Vera Cruz, the most remarkable effect on the trade in luscious Spanish wines (*vins liqueux*). These wines, however, are only drunk by the wealthy class of the inhabitants. The Indians, Mestizoes, Mulattoes, and even the greatest number of white Creoles, prefer the fermented juice of the agave, called *pulque*, of which there is annually consumed the enormous quantity of 44 millions of bottles, containing 48 cubic inches* each. The immense population of Paris only consumed annually in the time of M. Lavoisier 281,000 muids of wine, brandy, cyder, and beer, equal to 80,928,000 bottles †.

The consumption of bread at Mexico is equal to

* 58.141 cubic inches English. *Trans.*

† These bottles must contain somewhat more than the English. It is believed that an English gallon generally runs five bottles, in which case the bottle would only contain 46 cubic inches; but even supposing two pints to the bottle, it would only contain 57.8 cubic inches, still somewhat less than the above. *Trans.*

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that of the cities of Europe. This fact is so much the more remarkable, as at Caraccas, at Cumana, and Carthagena de las Indias, and in all the cities of America situated under the torrid zone, but on a level with the ocean, or very little above it, the creole inhabitants live on almost nothing but maize bread, and the jatropha manihot. If we suppose, with M. Arnould, that 325 pounds of flour yield 416 pounds of bread, we shall find that the 130,000 loads of flour consumed at Mexico yield 49,900,000 pounds of bread, which amounts to 363 pounds* per individual of every age. Estimating the habitual population of Paris at 547,000 inhabitants, and the consumption of bread at 206,788,000 pounds, we shall find the consumption of each individual in Paris 377 pounds†. At Mexico the consumption of maize is almost equal to that of wheat. The Turkish corn is the food most in request among the Indians. We may apply to it the denomination which Pliny gives to

* 391$\frac{8}{10}$lb. averd. *Trans.* † 406$\frac{2}{10}$lb. averd. *Trans.*

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barley (the κριθη of Homer*) *antiquissimum frumentum;* for the zea maize was the only farinaceous gramen cultivated by the Americans before the arrival of the Europeans.

The market of Mexico is richly supplied with eatables, particularly with roots and fruits of every sort. It is a most interesting spectacle, which may be enjoyed every morning at sun-rise, to see these provisions, and a great quantity of flowers, brought in by Indians in boats, descending the canals of Istacalco and Chalco. The greater part of these roots is cultivated on the *chinampas*, called by the

* Homer it is believed never uses κριθη but κρι. This is an affair of small consequence, to be sure; but since Homer has been referred to, it is just as well to state correctly what is to be found in him. κρι is to be used in the following passages, and perhaps elsewhere.

. . . Παρα δε σφιν εκαστω διζυγες ἱπποι
Εστασι, κρῖ λευκον ερεπτομενοι και ολυρας. Il. E. 195-6.
Ἱπποι δε κρῖ λευκον ερεπτομενοι και ολυρας
Εστασιν. Il. Θ. 560-1.
Πυροι τε ζειαι τ' ηδ' ευρυφυες κρῖ λευκον. Od.—*Trans.*

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Europeans floating gardens. There are two sorts of them, of which the one is moveable, and driven about by the winds, and the other fixed and attached to the shore. The first alone merit the denomination of floating gardens, but their number is daily diminishing.

The ingenious invention of chinampas appears to go back to the end of the 14th century. It had its origin in the extraordinary situation of a people surrounded with enemies, and compelled to live in the midst of a lake little abounding in fish, who were forced to fall upon every means of procuring subsistence. It is even probable that nature herself suggested to the Aztecs the first idea of floating gardens. On the marshy banks of the lakes of Xochimilco and Chalco, the agitated water in the time of the great rises carries away pieces of earth covered with herbs, and bound together by roots. These, floating about for a long time as they are driven by the wind, sometimes unite into small islands. A tribe of men, too weak to defend themselves on the continent, would take advantage

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of these portions of ground which accident put within their reach, and of which no enemy disputed the property. The oldest chinampas were merely bits of ground joined together artificially, and dug and sown upon by the Aztecs. These floating islands are to be met with in all the zones. I have seen them in the kingdom of Quito, on the river Guayaquil, of eight or nine* metres in length, floating in the midst of the current, and bearing young shoots of bambusa, pistia stratiotes, pontederia, and a number of other vegetables, of which the roots are easily interlaced. I have found also in Italy, in the small *lago di aqua solfa* of Tivoli, near the hot baths of Agrippa, small islands formed of sulphur, carbonate of lime, and the leaves of the ulva thermalis, which change their place with the smallest breath of wind†.

* 26 or 29 feet. *Trans.*

† Floating gardens are, as is well known, also to be met with in the rivers and canals of China, where an excessive population compels the inhabitants to have recourse to every shift for increasing the means of subsistence. *Trans.*

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Simple lumps of earth, carried away from the banks, have given rise to the invention of chinampas; but the industry of the Aztec nation gradually carried this system of cultivation to perfection. The floating gardens, of which very many were found by the Spaniards, and of which many still exist in the lake of Chalco, were rafts formed of reeds (totora), rushes, roots, and branches of brushwood. The Indians cover these light and well-connected materials with black mould, naturally impregnated with muriate of soda. The soil is gradually purified from this salt by washing it with the water of the lake; and the ground becomes so much the more fertile as this lixiviation is annually repeated. This process succeeds even with the salt water of the lake of Tezcuco, because this water, by no means at the point of its saturation, is still capable of dissolving salt as it filtrates through the mould. The chinampas sometimes contain even the cottage of the Indian who acts as guard for a groupe of floating gardens. They are towed or pushed with long poles when

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wished to be removed from one side of the banks to the other.

In proportion as the fresh water lake has become more distant from the salt water lake, the moveable chinampas have become fixed. We see this last class all along the canal de la Viga, in the marshy ground between the lake of Chalco and the lake of Tezcuco. Every chinampa forms a parallelogram of 100 metres in length, and from five to six metres in breadth*. Narrow ditches, communicating symmetrically between them, separate these squares. The mould fit for cultivation, purified from salt by frequent irrigations, rises nearly a metre† above the surface of the surrounding water. On these chinampas are cultivated beans, small pease, pimento (chile, capsicum), potatoes, artichokes, cauliflowers, and a great variety of other vegetables. The edges of these squares are generally ornamented with flowers, and sometimes even with a hedge of rose bushes.

* 328 by 16 or 19 feet. *Trans.* † 3.28 feet. *Trans.*

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The promenade in boats around the chinampas of Istacalco is one of the most agreeable that can be enjoyed in the environs of Mexico. The vegetation is extremely vigorous on a soil continually refreshed with water.

The valley of Tenochtitlan offers to the examination of naturalists two sources of mineral water, that of Nuestra Señora de Guadelupe, and that of the Peñon de los Baños. These sources contain carbonic acid, sulfate of lime and soda, and muriate of soda. Baths have been established there in a manner equally salutary and convenient. The Indians manufacture their salt near the Peñon de los Baños. They wash clayey lands full of muriate of soda, and concentrate water which have only 12 or 13 to the 100 of salt. Their caldrons, which are very ill constructed, have only six square feet of surface, and from two to three inches of depth. No other combustible is employed but the mules and cow dung. The fire is so ill managed, that to produce twelve pounds of salt,

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which sells at 35 sous *, they consume 12 sous-worth of combustibles †. This salt-pit existed in the time of Motezuma, and no change has taken place in the technical process but the substitution of caldrons of beaten copper to the old earthen vats.

The hill of Chapoltepec was chosen by the young viceroy Galvez as the site of a villa (Chateau de Plaisance) for himself and his successors. The castle has been finished externally, but the apartments are not yet furnished. This building cost the king nearly a million and a half of livres ‡. The court of Madrid disapproved of the expense, but, as usual, after it was laid out. The plan of this edifice is very singular. It is fortified on the side of the city of Mexico. We perceive salient walls and parapets adapted for cannon, though these parts have all the appearance of mere architectural ornaments. Towards the north there are

* 1*s.* 5½*d.* *Trans.* † 5½*d.* *Trans.*

‡ 62,505*l.* sterling. *Trans.*

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fosses and vast vaults capable of containing provisions for several months. The common opinion at Mexico is, that the house of the viceroy at Chapoltepec is a disguised fortress. Count Bernardo de Galvez was accused of having conceived the project of rendering New Spain independent of the peninsula; and it was supposed that the rock of Chapoltepec was destined for an asylum and defence to him in case of attack from the European troops. I have seen men of respectability in the first situations who entertained this suspicion against the young vicerroy. It is the duty of a historian, however, not to yield too easy an acquiescence to accusations of so grave a nature. The Count de Galvez belonged to a family that King Charles the Third had suddenly raised to an extraordinary degree of wealth and power. Young, amiable, and addicted to pleasures and magnificence, he had obtained from the munificence of his sovereign one of the first places to which an individual could be exalted; and, consequently, it could not be becoming in him to break the ties

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which for three centuries had united the colonies to the mother country *. The Count de Galvez, notwithstanding his conduct was well calculated to gain the favour of the populace of Mexico, and notwithstanding the influence of the Countess de Galvez, as beautiful as she was generally beloved, would have experienced the fate of every European viceroy † who aims at independence. In a

* What the intentions of Galvez were is another affair; but can the author seriously believe that these circumstances really do away the suspicions which he has mentioned? No person was so likely to conceive a project of the sort as a man dazzled with the suddenness of his elevation; fond of magnificence, and eager for popularity. Alas! gratitude is but a small obstacle in the way of ambition.—*Trans.*

† Of the fifty viceroys who have governed Mexico from 1536 to 1808, one alone was born in America, the Peruvian Don Juan de Acuña, Marquis de Casa Fuerte (1722-1734), a disinterested man and good administrator. Some of my readers will, perhaps, be interested in knowing that a descendant of Christopher Columbus and a descendant of King Motezuma were among the viceroys of New Spain. Don Pedro Nuño Colon, Duke de Veraguas, made his entry at Mexico in 1673, and

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great revolutionary commotion, it would never have been forgiven him that he was not born an American.

The castle of Chapoltepec should be sold for the advantage of the government. As in every country it is difficult to find individuals fond of purchasing strong places, several of the ministers of the *Real Hacienda* have begun, by selling to the highest bidder the glass and sashes of the windows. This vandalism, which passes by the name of economy, has already much contributed to degrade an edifice on an elevation of 2325 metres *, and which, in a climate so rude, is exposed to all the impetuosity of the winds. It would, perhaps, be prudent to preserve this castle as the only place in which the archives, bars of silver, and coin,

died six days afterwards. The viceroy Don Joseph Sarmiento Valladares, Count de Motezuma, governed from 1697 to 1701.

* 7626 feet. The reader need not be told, that this is to be understood as the elevation above the level of the sea, and not the height of the hill of Chapoltepec.—*Trans.*

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could be placed, and the person of the viceroy could be in safety, in the first moments of a popular commotion. The commotions (motinos) of the 12th February, 1608, 15th January 1624 and 1692, are still in remembrance at Mexico. In the last of these, the Indians, from want of maize, burned the palace of the viceroy Don Gaspar de Sandoval, Count of Galvez, who took refuge in the garden of the convent of St. Francis. But it was only in those times that the protection of the monks was equivalent to the security of a fortified castle.

To terminate the description of the valley of Mexico, it remains for us to give a rapid hydrographical view of this country so intersected with lakes and small rivers. This view, I flatter myself, will be equally interesting to the naturalist and the civil engineer. We have already said, that the surface of the four principal lakes occupies nearly a tenth of the valley, or 22 square leagues. The lake of Xochimilco (and Cholco) contains $6\frac{1}{2}$, the lake of Tezcuco $10\frac{1}{10}$, San

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Christobal $3\frac{6}{10}$, and Zumpango $1\frac{3}{10}$ square leagues (of 25 to the equatorial degree). The valley of Tenochtitlan, or Mexico, is a basin surrounded by a circular wall of porphyry mountains of great elevation. This basin, of which the bottom is elevated 2277 metres * above the level of the sea, resembles, on a small scale, the vast basin of Bohemia, and (if the comparison is not too bold) the vallies of the Mountains of the Moon, described by MM. Herschel and Schroeter. All the humidity furnished by the Cordilleras which surround the plain of Tenochtitlan is collected in the valley. No river issues out of it, if we except the small brook (arroyo of Tequisquiac, which, in a ravine of small breadth, traverses the northern chain of the mountains, to throw itself into the Rio de Tula, or Moteuczoma.

The principal supplies of the lakes of the valley of Tenochtitlan are, 1. the rivers of Papalotla, Tezcuco, Teotihuacan, and Tepeyacac (Guada-

* 7468 feet. *Trans.*

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lupe), which pour their waters into the lake of Tezcuco; 2. the rivers of Pachuca and Guautitlan (*Quauhtitlan*), which flow into the lake of Zumpango. The latter of these rivers (the Rio de Guautitlan) has the longest course; and its volume of water is more considerable than that of all the other supplies put together.

The Mexican lakes, which are so many natural recipients, in which the torrents deposit the waters of the surrounding mountains, rise by stages, in proportion to their distance from the centre of the valley, or the site of the capital. After the lake of Tezcuco, the city of Mexico is the least elevated point of the whole valley. According to the very accurate survey of MM. Velasquez and Castera, the *Plaza Mayor* of Mexico, at the south corner of the viceroy's palace, is one Mexican vara, one foot, and one inch * higher than the

* According to the classical work of M. Ciscar (*Sobre los nuevos pesos y medidas decimales*), the Castilian vara is to the toise = 0,5130 : 1,1963, and a toise = 2,3316 varas. Don Jorge Juan estimated a Castilian vara at three feet of Burgos,

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mean level of the lake of Tezcuco *, which again is four varas and eight inches lower than the lake

and every foot of Burgos contains 123 lines two-thirds of the *pied du Roi*. The court of Madrid ordered in 1783 the corps of sea artillery to make use of the measure of varas, and the corps of land artillery the French toise, a difference of which it would be difficult to point out the utility.—*Compendio de Matemáticas de Don Francisco Xavier Rovira*, tom. iv. p. 57 and 63. The Mexican vara is equal to 0^m, 839.

* The manuscript materials of which I have availed myself in the compilation of this notice are, 1. the minute plans drawn up in 1802, by orders of the dean of the High Court of Justice *(Decano de la Real Audiencia de Mexico)*, Don Cosme de Mier y Trespalacoios; 2. the memoir presented by Don Juan Diaz de la Calle, second secretary of state at Madrid in 1646, to King Philip IV.; 3. The instructions transmitted by the venerable Palafox, bishop of la Puebla and viceroy of New Spain, in 1642, to his successor the viceroy Count de Salvatierra (Marques de Sobroso); 4. a memoir which Cardinal de Lorenzana, then archbishop of Mexico, presented to the viceroy Buccarelli; 5. a notice drawn up by the Tribunal de Cuentas of Mexico; 6. a memoir drawn up by orders of the Count de Revillagigedo; and 7. the *Informe de Velasquez*. I ought also to mention here the curious work of *Zepeda*,

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of San Christobal, whereof the northern part is called the lake of Xaltocan *. In this northern part, on two small islands, the villages of Xaltocan and Tonanitla are situated. The lake of San Christobal, properly so called, is separated from that of Xaltocan by a very ancient dike which leads to the villages of San Pablo and San Tomas de Chiconautla. The most northern lake of the valley of Mexico, Zumpango *(Tzompango)*, is 10 varas 1 foot 6 inches higher than the mean level of the lake of Tezcuco †. A dike *(la Calzada de la Cruz del Rey)* divides the lake of Zumpango

Historia del Desagüe, printed at Mexico. I have twice myself examined the canal of Huehuetoca, once in August 1803, and the second time from the 9th to the 12th January, 1804, in the company of the viceroy Don Jose de Iturrigaray, whose kindness and frankness of procedure towards me I cannot speak in too high terms of. (See note D at the end of this work).

* The elevation of the Plaza Mayor, therefore, above Tezcuco is 47.245 inches, and that of San Christobal 11 feet 8.863 inches. *Trans.*

† 29 feet 1 inch 888. *Trans.*

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into two basins, of which the most western bears the name of Laguna de Zitlaltepec, and the most eastern the name of Laguna de Coyotepec. The lake of Chalco is at the southern extremity of the valley. It contains the pretty little village of Xico, founded on a small island; and it is separated from the lake of Xochimilco by the Calzada de San Pedro de Tlahua, a narrow dike which runs from Tuliagualco to San Francisco Tlaltengo. The level of the fresh-water lakes of Chalco and Xochimilco is only 1 vara 11 inches higher than the Plaza Mayor of the capital*. I thought that these details might be interesting to civil engineers wishing to form an exact idea of the great canal (Desague) of Huehuetoca.

The difference of elevation of the four great reservoirs of water of the valley of Tenochtitlan was sensibly felt in the great inundations to which the city of Mexico for a long series of ages has been exposed. In all of them the sequence of the phenomena has been uniformly the same. The

* 3 feet 9 inches. *Trans.*

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lake of Zumpango, swelled by the extraordinary increases of the Rio de Guautitlan, and the influxes from Pachuca, flows over into the lake of San Christobal, with which the *Cienegas* of Tepejuelo and Tlapanahuiloya communicate. The lake of San Christobal bursts the dike which separates it from the lake of Tezcuco. Lastly, the water of this last basin rises in level from the accumulated influx more than a metre *, and traversing the saline grounds of San Lazaro, flows, with impetuosity into the streets of Mexico. Such is the general progress of the inundations: they proceed from the north and the north-west. The drain or canal called the Desague Real de Huehuetoca is destined to prevent any danger from them; but it is certain, however, that from a coincidence of several circumstances, the inundations of the south *(avenidas del Sur)*, on which, unfortunately, the Desague has no influence, may be equally disastrous to the capital. The lakes of Chalco and Xochimilco would overflow, if in a strong eruption of the volcano

* 39.371 inches. *Trans.*

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Popocatepetl, this colossal mountain should suddenly be stripped of its snows. While I was at Guayaquil, on the coast of the province of Quito, in 1802, the cone of Cotopaxi was heated to such a degree by the effect of the volcanic fire, that almost in one night it lost the enormous mass of snow with which it is covered. In the new continent eruptions and great earthquakes are often followed with heavy showers, which last for whole months. With what dangers would not the capital be threatened were these phenomena to take place in the valley of Mexico, under a zone; where, in years by no means humid, the rain which falls amounts to 15 decimetres *.

The inhabitants of New Spain think that they can perceive something like a constant period in the number of years which intervene between the great inundations. Experience has proved that the extraordinary inundations in the valley of Mexico have followed nearly at intervals of 25

* 59 inches. *Trans.*

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years *. Since the arrival of the Spaniards the city has experienced five great inundations, viz. in 1553, under the viceroy Don Luis de Velasco (el Viejo), constable of Castile; in 1580, under the viceroy Don Martin Enrequez de Alamanza; in 1604, under the viceroy Montesclaros; in 1607, under the viceroy Don Luis de Velasco (el Segundo), Marquis de Salinas; and in 1629, under the viceroy Marquis de Ceralvo. This last inundation is the only one which has taken place since the opening of the canal of Huehuetoca; and we shall see hereafter what were the circumstances which produced it. Since the year 1629 there have still been, however, several very alarming swellings of the waters, but the city was preserved by the *desague*. These seven very rainy years were 1648, 1675, 1707, 1732, 1748, 1772, 1795.

* Toaldo pretends to be able to deduce from a great number of observations, that the very rainy years, and consequently the great inundations, return, every 19 years, according to the terms of the cycle of Saros.—*Rozier, Journal de Physique*, 1783.

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Comparing together the foregoing eleven epoquas, we shall find for the period of the fatal recurrence the numbers of 27, 24, 3, 26, 19, 27, 32, 25, 16, 24, and 23; a series which undoubtedly denotes somewhat more regularity than what is observed at Lima in the return of the great earthquakes.

The situation of the capital of Mexico is so much the more dangerous, that the difference of level between the surface of the lake of Tezcuco and the ground on which the houses are built is every year diminishing. This ground is a fixed plane, particularly since all the streets of Mexico were paved under the government of the Count de Revillagigedo; but the bed of the lake of Tezcuco is progressively rising from the mud brought down by the small torrents, which is deposited in the reservoirs into which they flow. To avoid a similar inconvenience, the Venetians turned from their Lagunas the Brenta, the Piave, the Livenza, and other rivers, which formed deposits in them *.

* Andreossy on the Canal of the South, p. 19.

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If we could rely on the results of a survey executed in the 16th century, we should no doubt find that the Plaza Mayor of Mexico was formerly more than eleven decimetres * elevated above the level of the lake of Tezcuco, and that the mean level of the lake varies from year to year. If, on the one hand, the humidity of the atmosphere and the sources have diminished in the mountains surrounding the valley, from the destruction of the forests; on the other hand, the cultivation of the land has increased the depositions and the rapidity of the inundations. General Andreossy, in his excellent work on the canal of Languedoc, has insisted a great deal on these causes, which are common to all climates. Waters which glide over declivities covered with sward, carry much less of the soil along with them than those which run over loose soil. Now the sward, whether formed from gramina, as in Europe, or small alpine plants, as in Mexico, is only to be pre-

* 43$\frac{3}{10}$ *Trans.*

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served in the shade of a forest. The shrubs and underwood oppose also powerful obstacles to the melted snow which runs down the declivities of the mountains. When these declivities are stripped of their vegetation, the streams are less opposed, and more easily unite with the torrents which swell the lakes in the neighbourhood of Mexico.

It is natural enough, that in the order of hydraulical operations undertaken to preserve the capital from the danger of inundation, the system of *dikes* preceded that of evacuating canals or drains. When the city of Tenochtitlan was inundated to such a degree in 1446 that none of its streets remained dry, Motezuma I. *(Huehue Moteuczoma)*, by advice of Nezahualcojotl, king of Tezcuco, ordered a dike to be constructed of more than 12,000 metres in length, and 20 in breadth *. This dike, partly constructed in the lake, consisted of a wall of

* 395,369 by 65.6 feet. *Trans.*

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stones and clay, supported on each side by a range of palisadoes, of which considerable remains are yet to be seen in the plains of San Lazaro. This dike of Motezuma I. was enlarged and repaired after the great inundation in 1498, occasioned by the imprudence of King Ahuitzotl. This prince, as we have already observed, ordered the abundant sources of Huitzilopochco to be conducted into the lake of Tezcuco. He forgot that the lake of Tezcuco, however destitute of water in time of drought, becomes so much the more dangerous in the rainy season, as the number of its supplies is increased. Ahuitzotl ordered Tzotzomatzin, citizen of Coyohuacan, to be put to death, because he had courage enough to predict the danger to which the new aqueduct of Huitzilopochco would expose the capital. Shortly afterwards the young Mexican king very narrowly escaped drowning in his palace. The water increased with such rapidity, that the prince was grievously wounded in the head, while saving himself, by a

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door which led from the lower apartments to the street.

The Aztecs had thus constructed the dikes (calzadas) of Tlahua and Mexicaltzingo, and l'Albaradon, which extends from Iztapalapan to Tepeyacac (Guadalupe), and of which the ruins at present are still very useful to the city of Mexico. This system of dikes, which the Spaniards continued to follow till the commencement of the 17th century, afforded means of defence, which, if not quite secure, were at least nearly adequate, at a period when the inhabitants of Tenochtitlan sailing in canoes were more indifferent to the effects of the more trifling inundations. The abundance of forests and plantations afforded them great facilities for constructions on piles. The produce of the floating gardens (chinampas) was adequate to the wants of a frugal nation. A very small portion of ground fit for cultivation was all that the people required. The overflow of the lake of Tezcuco was less alarming to men who lived in houses, many of which could be traversed by canoes.

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When the new city, rebuilt by Hernan Cortez, experienced the first inundation in 1553, the viceroy Velasco I. caused the Albaradon de San Lazaro to be constructed. This work, executed after the model of the Indian dikes, suffered a great deal from the second inundation of 1580. In the third of 1604 it had to be wholly rebuilt. The viceroy Montesclaros then added, for the safety of the capital, the *Presa* d'Oculma, and the three *calzadas* of Nuestra Señora de Guadalupe, San Christobal, and San Antonio Abad.

These great constructions were scarcely finished, when, from a concurrence of extraordinary circumstances, the capital was again inundated in 1607. Two inundations had never before followed so closely upon one another; and the fatal cycle of these calamities has never since been shorter than sixteen or seventeen years. Tired of constructing dikes *(albaradones)* which the water periodically destroyed, they discovered at last that it was time to abandon the old hydraulical system of the Indians, and to adopt that of

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canals of evacuation. This change appeared so much the more necessary, as the city inhabited by the Spaniards had no resemblance in the least to the capital of the Aztec empire. The lower part of the houses was now inhabited; few streets could be passed through in boats; and the inconveniences and real losses occasioned by the inundations were consequently much greater than what they had been in the time of Motezuma.

The extraordinary rise of the river Guautitlan and its tributary streams being looked upon as the principal cause of the inundations, the idea naturally occurred of preventing this river from discharging itself into the lake of Zumpango, the mean level of the surface of which is 7½ metres* higher than the Plaza Mayor of Mexico. In a valley circularly surrounded by high mountains, it was only possible to find a vent for the Rio de Guautitlan through a subterraneous gallery, or an open canal through these very mountains. In

* 24 $\frac{6}{10}$ feet. *Trans.*

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fact, in 1580, at the epoch of the great inundation, two intelligent men, the *licenciado Obregon*, and the *maestro Arciniega*, proposed to government to have a gallery pierced between the Cerro de Sincoque, and the Loma of Nochistongo. This was the point which more than any other was likely to fix the attention of those who had studied the configuration of the Mexican ground. It was nearest to the Rio de Guautitlan, justly considered the most dangerous enemy of the capital. Nowhere the mountains surrounding the valley are less elevated, and present a smaller mass than to the N.N.W. of Huehuetoca, near the hills of Nochistongo. One would say on examining attentively the marle soil of which the horizontal strata fill a porphyretical defile, that the valley of Tenochtitlan formerly communicated at that place with the valley of Tula.

In 1607, the Marquis de Salinas, viceroy, employed *Enrico Martinez* to carry through the artificial evacuation of the Mexican lakes. It is generally believed in New Spain that this cele-

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brated engineer, the author of the *Desague de Huehuetoca*, was a Dutchman or a German. His name undoubtedly denotes that he was of foreign descent; but he appears, however, to have received his education in Spain. The king conferred on him the title of cosmographer; and there is a treatise of his on trigonometry, printed at Mexico, which is now become very scarce. Enrico Martinez, Alonso Martinez, Damian Davila, and Juan de Ysla, made an exact survey of the valley, of which the accuracy was ascertained by the operations of the learned geometrician Don Joaquim Velasquez in 1774. The royal cosmographer, Enrico Martinez, presented two plans of canals, the one to evacuate the three lakes of Tezcuco, Zumpango, and San Christobal, and the other the lake of Zumpango alone; and, agreeably to both projects, the evacuation of the water was to take place through the subterraneous gallery of Nochistongo, proposed in 1580 by Obregon and Arciniega. But the distance of the lakes of Tezcuco from the mouth of the Rio de Guautitlan being nearly

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32,000 metres*, the government confined themselves to the canal of Zumpango. This canal was so constructed as to receive at the same time the waters of the lake, and those of the river of Guautitlan; and it is consequently not true that the *desague* projected by Martinez was *negative* in its principle, that is to say, that it merely prevented the Rio de Guautitlan from discharging itself into the lake of Zumpango. The branch of the canal which conducted the water from the lake to the gallery was filled up by depositions of mud, and the desague was only useful then for the Rio de Guautitlan, which was turned from its course; so that when M. Mier recently undertook the direct evacuation of the lakes of San Christobal and Zumpango, it was hardly remembered at Mexico that 188 years before the same work had already been carried into execution with respect to the former† of these great basins.

* 104,987 feet. *Trans.*

† The author evidently means Zumpango, which, as the sentence is constructed, is not the *former*, but the *latter*. *Trans.*

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The famous subterraneous gallery of Nochistongo was commenced on the 28th November, 1607. The viceroy, in presence of the *audiencia*, applied the first pick-axe. Fifteen thousand Indians were employed at this work, which was terminated with extraordinary celerity, because the work was carried on in a number of pits at the same time. The unfortunate Indians were treated with the greatest severity. The use of the pick-axe and shovel was sufficient to pierce such loose and crumbling earth. After eleven months of continued labour, the gallery (el *socabon*) was completed. Its length was more than 6600 metres* (or 1.48 common leagues †), its breadth $3^{m}.5$‡, and its height $4^{m}.2$‖. In the month of December, 1608, the viceroy and archbishop of Mexico were invited by Martinez to repair to Huehuetoca, to see the water flow§ from the

* 21,653 feet. *Trans.*

† Of 25 to the sexagesimal degree, 4443 metres each.

‡ 11.484feet. *Trans.* ‖ 13.779 feet. *Trans.*

§ The water flowed for the first time on the 17th September, 1608.

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lake of Zumpango and the Rio de Guautitlan through the gallery. The Marquis de Salinas, the viceroy, according to Zepeda's account, entered more than 2000 metres* on horseback into this subterraneous passage. On the opposite side of the hill of Nochistongo is the Rio de Moctesuma (or Tula), which runs into the Rio de Panuco. From the northern extremity of the socabon, called the Boca de San Gregorio, Martinez carried on an open trench for a direct distance of 8600 metres† which conducted the water from the gallery to the small cascade (*salto*) of the Rio de Tula. From this cascade the water has yet to descend according to my measurement, before it reaches the gulph of Mexico, near the bar of Tampico, nearly 2153 metres‡, which gives for a length of 323,000 metres‖ a mean fall of 6¾ metres in the 1000.

A subterraneous passage serving for a canal of

* 6561 feet. *Trans.* † 28,214 feet. *Trans.*
‡ 7056 feet. *Trans.* ‖ 1,059,714 feet. *Trans.*

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evacuation, of 6600 metres in length, and an aperture of 10½ square metres in section*, finished in less than a year, is a hydraulical operation which in our times, even in Europe, would draw the attention of engineers. It is only, in fact, since the end of the seventeenth century, from the example set by the illustrious Francis Andreossy in the canal of Languedoc, that these subterraneous apertures have become common. The canal which joins the Thames with the Severn passes, near Sapperton, for a length of more than 4000 metres†, through a chain of very elevated mountains. The great subterraneous canal of Bridgewater, which, near Worsley, in the neighbourhood of Manchester, serves for the carriage of coals, has an extent, including its different ramifications, of 19,200 metres‡ (or $4\frac{3}{10}$ common

* The aperture was said a little before to be 3^m, 5 in breadth, and 4^m, 2 in height. The square of this is not 10½ but 14.7 metres, which correspond to 158 square feet. *Trans.*

† 13,123 feet. *Trans.* ‡ 62,991 feet. *Trans.*

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leagues). The canal of Picardy, which is at present going on, ought, according to the first plan, to have a subterraneous navigable passage of 13,700 metres in length, 7 metres in breadth, and 8 metres* in height †.

Scarcely had a part of the water of the valley of Mexico begun to flow towards the Atlantic ocean, when Enrico Martinez was reproached with having dug a gallery neither broad nor durable, nor deep enough to admit the water of the great swellings. The chief engineer (Maestro del Desague) replied, that he had presented several plans, but that the government had chosen the

* 45.300 feet in height, 26.965 in breadth, and 26.246 in height. *Trans.*

† *Millar and Vazic on canals*, 1807. The Georg-Stolten in the Harz, a gallery begun in 1777, and finished in 1800, contains 10,438 metres in length (34,244 feet), and cost 1,600,000 francs (71,172*l.*). Near Forth coal mines are worked for more than 3000 metres (9842 feet) under the sea without being exposed to filtrations. The subterraneous canal of Bridgewater is in length equal to two-thirds of the breadth of the Straits of Dover.

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remedy of most prompt execution. In fact, the filtrations and erosions occasioned by the alternate states of humidity and aridity caused the loose earth frequently to crumble down. They were soon compelled to support the roof, which was only composed of alternate strata of marle, and a stiff clay called *tepetate*. They made use at first of wood, by throwing planks across, which rested on pillars; but as resinous wood was not very plentiful in that part of the valley, Martinez substituted masonry in its place. This masonry, if we judge of it from the remains discovered in the *obra del consulado*, was very well executed; but it was conducted on an erroneous principle. The engineer, in place of fortifying the gallery from top to bottom with a complete vault of an elliptical form (as is done in mines whenever a gallery is cut through loose sand), merely constructed arches, which had no sufficient foundation to rest on. The water, to which too great a fall was given, gradually undermined the lateral walls, and deposited an enormous quantity

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of earth and gravel in the water-course of the gallery, because no means were taken to filtrate it, by making it previously pass, for example, through reticulations of *petate*, executed by the Indians with filaments of the shoots of palm trees. To obviate these inconveniences, Martinez constructed in the gallery at intervals a species of small sluices, which, in opening rapidly, were to clear the passage. This means, however, proved insufficient, and the gallery was stopt up by the perpetual falling in of earth.

From the year 1608 the Mexican engineers began to dispute whether it was proper to enlarge the *socabon* of Nochistongo, or to finish the walling, or to make an uncovered aperture by taking off the upper part of the vault, or to commence a new gallery farther down, capable of also receiving, besides the waters of the Rio de Guautitlan, and the lake of Zumpango, those of the lake of Tezcuco. The archbishop Don Garcia Guerra, a Dominican, then viceroy, ordered new surveys to be made in 1611 by Alonso de Arias,

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superintendant of the royal arsenal (*armero mayor*), and inspector of fortifications (*maestro mayor de fortificaciones*), a man of probity, who then enjoyed great reputation. Arias seemed to approve of the operations of Martinez, but the viceroy could not fix on any definitive resolution. The court of Madrid, wearied out with these disputes of the engineers, sent to Mexico in 1614 Adrian Boot, a Dutchman, whose knowledge of hydraulic architecture is extolled in the memoirs of those times preserved in the archives of the viceroyalty. This stranger, recommended to Philip III. by his ambassador at the court of France, held forth again in favour of the Indian system; and he advised the construction of great dikes and well protected mounds of earth around the capital. He was unable, however, to bring about the entire relinquishment of the gallery of Nochistongo till the year 1623. A new viceroy, the Marquis de Guelves, had recently arrived at Mexico; and he had consequently never witnessed the inundations produced by the overflow of the

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river of Guautitlan. He had the temerity, however, to order Martinez to stop up the subterraneous passage, and make the water of Zumpango and San Christobal return to the lake of Tezcuco, that he might see if the danger was, in fact, so great as it had been represented to him. This last lake swelled in an extraordinary manner; and the orders were recalled. Martinez recommenced his operations in the gallery, which he continued till the 20th June* 1629, when an event occurred, the true causes of which have ever remained secret.

The rains had been very abundant; and the engineer stopt up the subterraneous passage. The city of Mexico was in the morning inundated to the height of a metre†. The Plaza Mayor, la Plaza del Volador, and the suburb of Tlatelolco alone remained dry. Boats went up and down

* According to some manuscript memoirs, the 20th September.

† 3¼ feet. *Trans.*

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the other streets. Martinez was committed to prison. It was pretended that he had shut up the gallery to give the incredulous a manifest and negative proof of the utility of his work; but the engineer declared that, seeing the mass of water was too considerable to be received into his narrow gallery, he preferred exposing the capital to the temporary danger of an inundation, to seeing destroyed in one day, by the impetuosity of the water, the labours of so many years. Contrary to every expectation, Mexico remained inundated for five years, from 1629 to 1634*. The streets were passed in boats, as had been done before the conquest in the old Tenochtitlan. Wooden bridges were constructed along the sides of the houses for the convenience of foot passengers.

In this interval four different projects were presented and discussed by the Marquis de Ceralvo,

* Several memoirs bear that the inundation only lasted till 1631, but that it broke out afresh towards the end of the year 1633.

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the viceroy. An inhabitant of Valladolid, Simon Mendez, affirmed in a memoir, that the ground of the valley of Tenochtitlan rose considerably on the N.W. side towards Huehuetoca, and the hill of Nochistongo; that the point where Martinez had opened the chain of mountains which circularly shuts in the valley corresponds to the mean level of the most elevated lake (Zumpango), and not to the level of the lowest (Tezcuco); and that the ground of the valley falls considerably to the north of the village of Carpio, east from the lakes of Zumpango and San Christobal. Mendez proposed to draw off the water of the lake of Tezcuco by a gallery which should pass between Xaltocan and Santa Lucia, and open into the brook *(arroyo)* of Tequisquiac, which, as has been already observed, falls into the Rio de Moctesuma or Tula. Mendez began this *desague*, projected at the lowest point; and four pits of ventilation (*lumbreras*) were already completed, when the government, perpetually irresolute and vacillating, abandoned the undertaking as being

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too long and too expensive. Another desiccation of the valley was projected in 1630 by Antonio Roman, and Juan Alvarez de Toledo, at an intermediate point, by the lake of San Christobal, the waters of which were proposed to be conducted to the ravin (*barranca*) of Huiputztla, north of the village of San Mateo, and four leagues west from the small town of Pachuca. The viceroy and audiencia paid as little attention to this project as to another of the mayor of Oculma, Christobal de Padilla, who, having discovered three perpendicular caverns, or natural gulphs (*boquerones*), even in the interior of the small town of Oculma, wished to avail himself of these holes for drawing off the water of the lakes. The small river of Teotihuacan is lost in these *boqueroncs*. Padilla proposed to turn also the water of the lake of Tezcuco into them, by bringing it to Oculma through the farm of Tezquititlan.

This idea of availing themselves of the natural caverns formed in the strata of porous amygdaloid gave rise to an analogous and equally gigantic project,

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in the head of Francisco Calderon the jesuit. This monk pretended that at the bottom of the lake of Tezcuco, near the Peñol de los Baños, there was a hole (*sumidero*), which, on being enlarged, would swallow up all the water. He endeavoured to support this assertion by the testimony of the most intelligent Indians, and by old Indian maps. The viceroy commissioned the prelates of all the religious orders (who no doubt were likely to be best informed in hydraulical matters) to examine this project. The monks and jesuit kept sounding in vain for three months, from September till December, 1635; but no *sumidero* was ever found, though, even yet, many Indians believe as firmly in its existence as Father Calderon. Whatever geological opinion may be formed of the volcanic or neptunian origin of the porous amygdaloid (*blasiger Mandelstein*) of the valley of Mexico, it is very improbable that this problematical rock contains hollows of dimension enough to receive the water of the lake of Tezcuco, which even in time of drought ought to be estimated at more

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than 251,700,000 cubic metres. It is only in secondary strata of gypsum, as in Thuringia, where we can sometimes venture to conduct inconsiderable masses of water into natural caverns (*gypsschlotten*); where galleries of discharge opened from the interior of a mine of coppery schistus are allowed to terminate, without any concern about the ulterior direction taken by the waters which impede the metallic operations. But how is it possible to employ this local measure in the case of a great hydraulical operation?

During the inundation of Mexico, which lasted five successive years, the wretchedness of the lower orders was singularly increased. Commerce was at a stand, many houses tumbled down, and others were rendered uninhabitable. In these unfortunate times the Archbishop Francisco Manzo y Zuniga distinguished himself by his beneficence. He went about daily in his canoe distributing bread among the poor. The court of Madrid gave orders a second time to transfer the city into the plains between Tacuba and Tacubaya;

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but the magistracy (*cabildo*) represented that the value of the edifices (*fincas*) which, in 1607, amounted to 1500 millions of livres, now amounted to more than 200 millions*. In the midst of these calamities the viceroy ordered the image of the holy virgin of Guadalupe† to be brought to

* 8,334,000*l.* sterling. *Trans.*

† In public calamities the inhabitants of Mexico have recourse to the two celebrated images of Nuestra Senora de la Guadalupe, and de los Remedios. The first is looked upon as indigenous, having first made its appearance among flowers in the handkerchief of an Indian; and the second was brought from Spain at the period of the conquest. The spirit of party which exists between the Creoles and Europeans (*Gachupines*) gives a particular turn to their devotion. The lower orders of Creoles and Indians are extremely discontented when the archbishop, during great droughts, orders in preference the image of the virgin de los Remedios to be brought to Mexico. Hence the proverb characteristic of the mutual hatred of the casts: Every thing, even our water, must come to us from Europe (*hasta el agua nos debe venir de la Gachupina!*). If, notwithstanding the residence of the holy virgin de los Remedios, the drowth continues, as some very rare examples of it are pretended to have taken place, the archbishop permits the

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Mexico. She remained for a long time in the inundated city. The waters, however, only retired in 1634, when from very strong and very frequent earthquakes the ground of the valley opened, a phenomenon which (as the incredulous say) was of no small assistance to the adorable virgin in her miracle.

The Marquis de Ceralvo, viceroy, set the engineer Martinez at liberty. He constructed the *calzada* (dike) of San Christobal, such nearly as we now see it. Sluices *(compertuas)* admit the communication of the lake of San Christobal with the lake of Tezcuco, of which the level is generally

Indians to go in quest of the image of our lady of Guadalupe. This permission diffuses gladness among the Mexican people, especially when the long droughts terminate (as they do every where else) in abundant rains. I have seen works of trigonometry printed in New Spain dedicated to the holy virgin of Guadalupe. On the hill of Tepejacac, at the foot of which her rich sanctuary is constructed, formerly stood the temple of the Mexican Ceres, called *Tonantzin* (our mother), or *Cen-teotl* (goddess of maize), or *Tzin-teotl* (generative goddess).

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from 30 to 32 decimetres lower*. Martinez had already begun, in 1609, to convert a small part of the subterraneous gallery of Nochistongo into an open trench. After the inundation in 1634, he was ordered to abandon this work as too tedious and expensive, and to finish the desague by enlarging his old gallery. The produce of a particular impost on the consumption of commodities (*derecho de sisas*) was destined by the Marquis de Salinas for the expenses of the hydraulical operations of Martinez. The Marquis de Cadereyta increased the revenues of the desague by a new imposition of 25 piastres on the importation of every pipe of Spanish wine. These duties still subsist, though but a small part of them is applied to the desague. In the beginning of the 18th century the court destined the half of the excise on wines to keep up the great fortifications of the castle of San Juan d'Ulua. Since 1779 the chest of the hydraulical operations of the valley of Mex-

* From 118 to 125 inches. *Trans.*

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ico does not draw more than five francs of the duties levied on each barrel of wine from Europe imported at Vera Cruz.

The operations of the *desague* were carried on with very little energy from 1634 to 1637, when the Marquis de Villena (Duke d'Escalona), viceroy, gave the charge of it to Father Luis Flores, commissary general of the order of St. Francis. The activity of this monk is much extolled, under whose administration the system of desiccation was changed for the third time. It was definitively resolved to abandon the gallery (*socabon*), to take off the top of the vault, and to make an immense cut through the mountain (*tajo abierto*), of which the old subterraneous passage was merely to be the water-course.

The monks of St. Francis contrived to retain the direction of hydraulical operations. It was so much the easier for them to do this, as at that epoqua* the viceroyalty was almost consecutively

* From 9th June, 1641, to 13th December, 1673.

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in the hands of Palafox, a bishop of Puebla, Torres, a bishop of Yucatan, a Count de Baños, who ended his brilliant career by becoming a barefooted Carmelite, and Enriquez de Ribera, a monk of St. Augustin, archbishop of Mexico. Wearied with the monastical ignorance and delay, a lawyer, the fiscal Martin de Solis, obtained from the court of Madrid, in 1675, the administration of the *desague*. He undertook to finish the cut through the chain of the mountains in two months; and his undertaking succeeded so well, that 80 years were hardly sufficient to repair the mischief which he did in a few days. The fiscal, by advice of the engineer Francisco Posuelo de Espinosa, caused more earth to be thrown at one time into the water-course than the shock of the water could carry along. The passage was stopt up. In 1760 remains of what had fallen in by the imprudence of Solis were still perceptible. The Count de Monclova, viceroy, very justly thought that the tardiness of the monks of St. Francis was still preferable to the rash activity of the jurisconsult.

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Father Fray Manuel Cabrera was reinstated in 1687 in his place of superintendant (*superintendente de la Real obra del desague de Huehuetoca*). He took his revenge of the fiscal, by publishing a book which bears the strange title of "Truth cleared up and impostures put to flight, by which a powerful and envenomed pen endeavoured to prove, in an absurd report, that the work of the desague was completed in 1675*."

The subterraneous passage had been opened and walled in a few years. It required two centuries to complete the open cut in a loose earth, and in sections of from 80 to 100† metres in breadth, and from 40 to 50‡ in perpendicular depth. The work was neglected in years of drought; but it

* *Verdad aclarada y desvanecidas imposturas, con que lo ardiente y envenenado de una pluma poderosa en esta Nueva España, en un dictamen mal instruido, quisò persuadir averse acabado y perfeccionado el año de 1675, la fabrica del Real Desague de Mexico.*

† From 262 to 328 feet. *Trans.*

‡ From 131 to 164 feet. *Trans.*

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was renewed with extraordinary energy for a few months after any great swelling or any overflow of the river of Guautitlan. The inundation with which the capital was threatened in 1747 induced the Count de Guemes to think of the *desague*. But a new delay took place till 1762, when after a very rainy winter there were strong appearances of inundation. There were still at the northern extremity of the subterraneous opening of Martinez 2310 Mexican varas, or 1938 metres*, which had never been converted into an open trench (*tajo abierto*). This gallery being too narrow, it frequently happened that the waters of the valley had not a free pa sage towards the Salto de Tula.

At length, in 1767, under the administration of a Flemish viceroy, the Marquis de Croix, the body of merchants of Mexico, forming the tribunal of the *Consulado* of the capital, undertook to finish the desague, provided they were allowed to levy the duties of sisa and the duty on wine, as an in-

* 6356 feet. *Trans.*

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demnification for their advances. The work was estimated by the engineers at six millions of francs*. The consulado executed it at an expense of four millions of francs †; but in place of completing it in five years (as had been stipulated), and in place of giving a breadth of eight metres ‡ to the water-course, the canal was only completed in 1789 of the old breadth of the gallery of Martinez. Since that period they have been incessantly endeavouring to improve the work by enlarging the cut, and especially by rendering the slope more gentle. However, the canal is yet far from being in such a state that fallings in are no more to be apprehended, which are so much the more dangerous as lateral erosions increase in the proportion of the obstacles which impede the course of the water.

On studying in the archives of Mexico the history of the hydraulical operations of Nochistongo,

* 250,020*l.* sterling. *Trans.* † 166,680*l.* sterling. *Trans.*

‡ 26¼ feet. *Trans.*

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we perceive a continual irresolution on the part of the governors, and a fluctuation of ideas calculated to increase the danger instead of removing it. We find visits made by the viceroy, accompanied by the audiencia and canons; papers drawn up by the fiscal and other lawyers; advices given by the monks of St. Francis; an active impetuosity every fifteen or twenty years, when the lakes threatened an overflow; and a tardiness and culpable indifference whenever the danger was past. Twenty-five millions of livres* were expended, because they never had courage to follow the same plan, and because they kept hesitating for two centuries between the Indian system of dikes and that of canals, between the subterraneous gallery *(socabon)*, and the open cut through the mountain *(tajo obierto)*. The gallery of Martinez was suffered to be choaked up, because a large and deeper one was wished; and the cut *(tajo)* of Nochistongo was neglected to be finished, while they were disputing about the pro-

* 1,041,750*l.* sterling. *Trans.*

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ject of a canal of Tezcuco, which was never executed.

The *desague* in its actual state is undoubtedly one of the most gigantic hydraulical operations ever executed by man. We look upon it with a species of admiration, particularly when we consider the nature of the ground, and the enormous breadth, depth, and length of the aperture. If this cut were filled with water to the depth of 10 metres*, the largest vessels of war could pass through the range of mountains which bound the plain of Mexico to the north-east. The admiration which this work inspires is mingled, however, with the most afflicting ideas. We call to mind at the sight of the cut of Nochistongo the number of Indians who perished there, either from the ignorance of the engineers, or the excess of the fatigues to which they were exposed in ages of barbarity and cruelty. We examine if such slow and costly means were necessary to carry off from a valley inclosed in on

* 32.8 feet. *Trans.*

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all sides so inconsiderable a mass of water; and we regret that so much collective strength was not employed in some greater and more useful object; in opening, for example, not a canal, but a passage through some isthmus which impedes navigation.

The project of Henry Martinez was wisely conceived, and executed with astonishing rapidity. The nature of the ground and the form of the valley necessarily prescribed such a subterraneous opening. The problem would have been resolved in a complete and durable manner; 1. if the gallery had been commenced in a lower point, that is to say, corresponding to the level of the inferior lake; and, 2. if this gallery had been pierced in an elliptical form, and wholly protected by a solid wall equally elliptically vaulted. The subterraneous passage executed by Martinez contained only 15 square metres* in section, as we have already observed. To judge of the dimensions necessary for

* 161 square feet. *Trans.*

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a gallery of this nature, we must know exactly the mass of water carried along by the river of Guautitlan and the lake of Zumpango at their greatest rise. I have found no estimation in the memoirs drawn up by Zepeda, Cabrera, Velasquez, and by M. Castera. But from the researches which I have myself made on the spot, in the part of the cut of the mountain (*el corte o tajo*) called *la obra del consulado*, it appeared to me that at the period of the ordinary rains the waters afford a section of from eight to ten square metres *, and that this quantity increases in the extraordinary swellings of the river Guautitlan to 30 or 40 † square metres ‡. The Indians assured me, that in this last case, the

* From 86 to 107½ square feet. *Trans.*

† From 322½ to 430½ square feet. *Trans.*

‡ The engineer Iniesta advanced even, that in the great rises the water ascends to the height of 20 or 25 metres (65 or 82 feet) in the canal near the *Boveda Real*. But Velasquez affirms that these estimations are enormously exaggerated. (*Declaracion del Maestro Iniesta*, and *Informe de Velasquez*, both in manuscript).

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water course which forms the bottom of the *tajo* is filled to such a degree, that the ruins of the old vault of Martinez are completely concealed under water. Had the engineers found great difficulties in the execution of an elliptical gallery of more than from four to five metres* in breadth, it would have been better to have supported the vault by a pillar in the centre, or to have opened two galleries at once, than to have made an open trench. These trenches are only advantageous when the hills are of small elevation and small breadth, and when they contain strata less subject to falling down. To pass a volume of water of a section in general of eight †, and sometimes from 15 to 20 square metres ‡, it has been judged expedient to open a trench, of which the section for considerable distances is from 1800 to 3000 square metres §.

* From 13 to 16 feet. *Trans.*

† 86 square feet. *Trans.*

‡ From 161 to 215 square feet. *Trans.*

§ From 19,365 to 32,275 square feet. *Trans.*

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In its present state the canal of derivation (*desague*) of Huehuetoca contains, according to the measurements of M. Velasquez*,

	Mex. varas.	Metres.
From the sluice of Vertideros to the bridge of Huehuetoca -	4870	or 4087
From the bridge of Huehuetoca to the sluice of Santa Maria	2660	2232
From the Compuerta de Santa Maria to the sluice of Valderas	1400	1175
From the Compuerta de Valderas to la Boveda Real - -	3290	2761
From la Boveda Real to the remains of the old subterraneous gallery called Techo Basso -	650	545
From Techo Basso to the gallery of the viceroys - -	1270	1066
Carry over -	14,140	11,866

* *Informe y exposicion de las operaciones hechas para examinar la possibilidad del desague general de la Laguna de Mexico y otros fines a el conducientes*, 1774 (manuscript memoir, folio 5.).

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	Mex. varas.	Metres.
Brought over -	14,140	11,866.
From the Cañon de los Vireyes to la Bocca de San Gregorio -	610	512
From the Bocca de San Gregorio to the demolished sluice -	1400	1175
From la Presa demolida to the cascade bridge - - -	7950	6671
From la Puente del Salto to the cascade itself (Salto del Rio de Tula) - - - -	430	361
Length of the canal from Vertideros to the Salto	V. 24,530	M. or 20,585*

In this length of $4\frac{3}{5}$ common leagues, the chain of the hills of Nochistongo (to the east of the Cerro de Sincoque), constituting a fourth part of it, has been cut to an extraordinary depth. At the point where the ridge is highest near the old well

* 67,535 feet. *Trans.*

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of Don Juan Garcia, for more than a length of 800 metres*, the cut in the mountains is from 45 to 60 metres † in perpendicular depth. From the one side to the other, the breadth at top is from 85 to 110 ‡ metres §. The depth of the cut is from 30 to 50 metres ‖, for a length of more than 3500 metres ¶. The water-course is generally only from three to four metres** in breadth; but in a great part of the desague the breadth of the cut is by no means in proportion to its depth, so that the sides in place of having a slope of 40° or 50° are much too rapid, and are perpetually falling

* 2624 feet. *Trans.* † From 147 to 196 feet. *Trans.*

‡ From 278 to 360 feet. *Trans.*

§ To have a clearer idea of the enormous breadth of this trench in the Obra del Consulado, we have only to recollect that the breadth of the Seine at Paris is at Port Bonaparte 102 metres (334 English feet), at Pont-Royal 136 metres (446 feet), and at the Pont d'Austerlitz, near the botanical garden, 175 metres (574 feet).

‖ From 98 to 131 feet. *Trans.* ¶ 11,482 feet. *Trans.*

** From 9.84 to 13.1 feet. *Trans.*

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in. It is in the *Obra del Consulado* where we principally see the enormous accumulations of moveable earth which nature has deposited on the porphyries of the valley of Mexico. I have reckoned, in descending the stair of the viceroys, 25 strata of hardened clay, with as many alternate strata of marle, containing fibrous calcareous balls of a cellular surface. It was in digging the trench of the desague that the fossile elephant bones were discovered, of which I have spoken in another work*.

On both sides of the cut we see considerable hills formed of the rubbish, which are gradually beginning to be covered with vegetation. The extraction of the rubbish having been an infinitely laborious and tedious operation, the method of Enrico Martinez was at last resorted to. They raised the level of the water by small sluices, so that the force of the current carried along the

*In the *Recueil de mes Observations de Zoologie et d'Anatomie comparée*.

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rubbish thrown into the water-course. During this operation, from 20 to 30 Indians have sometimes perished at a time. Cords were fastened round them, by which they were kept suspended in the current for the sake of collecting the rubbish into the middle of it; and it frequently happened that the impetuosity of the stream dashed them against detached masses of rock, which crushed them to death.

We have already observed that from the year 1643, the branch of Martinez's canal, directed towards the lake of Zumpango, had filled up, and that by that means (to use the expression of the Mexican engineers of the present day) the *desague* had become simply *negative*; that is to say, it prevented the river of Guautitlan to discharge itself into the lake. At the period of the great rises the disadvantages resulting from this state of things were sensibly felt in the city of Mexico. The Rio de Guautitlan, in overflowing, poured part of its water into the basin of Zumpango, which, swelled by the additional confluents of San Mateo and

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Pachuca, formed a junction with the lake of San Christobal. It would have been very expensive to enlarge the bed of the Rio de Guautitlan, to cut its sinuosities, and rectify its course; and even this remedy would not have wholly removed the danger of inundation. The very wise resolution was therefore adopted at the end of the last century, under the direction of Don Cosme de Mier y Trespalacios, superintendant general of the desague, of opening two canals to conduct the water from the lakes of Zumpango and San Christobal to the cut in the mountain at Nochistongo. The first of these canals was begun in 1796, and the second in 1798. The one is 8900, and the other 13,000 metres* in length. The canal of San Christobal joins that of Zumpango to the south-east of Huehuetoca, at 5000 metres† distance from its entry into the desague of Martinez. These two works cost more than a million of livres‡. They are water-courses, in which the level of the water

* 29,228 and 42,650 feet. *Trans.* † 16,404 feet. *Trans.*
‡ 41,670*l.* sterling. *Trans.*

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is from 8 to 12 metres* lower than the neighbouring ground; and they have the same defects on a small scale with the great trench of Nochistongo. Their slopes are much too rapid; in several places they are almost perpendicular. Hence the loose earth falls so frequently in, that it requires from 16,000 to 20,000† francs annually to keep these two canals of M. Mier in a proper condition. When the viceroys go to inspect *(hacer la visita)* the desague (a two days journey, which formerly brought them in a present of 3000 double piastres ‡) they embarked near their palace § from the south bank of the lake of San Christobal, and went even farther than Huehuetoca by water, a distance of seven common leagues.

It appears from a manuscript memoir of Don

* From 26 to 39 feet. *Trans.*

† From 666*l.* to 833*l.* sterling. *Trans.*

‡ 656*l.* sterling. *Trans.*

§ This pretended *Palacio de los Vireyes*, from which there is a magnificent view of the lake of Tezcuco, and the volcano of Popocatepec, covered with eternal snow, bears more resemblance to a great farm-house than to a palace.

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Ignacio Castera, present inspector (*maestro mayor*) of hydraulical operations in the valley of Mexico, that the desague cost, including the repairs of the dikes (*albaradones*), between 1607 and 1789, the sum of 5,547,670 double piastres. If we add to this enormous sum, from 6 to 700,000 piastres expended in the fifteen following years, we shall find that the whole of these operations (the cut through the mountains of Nochistango, the dikes, and the two canals from the upper lakes) have not cost less than 31 millions of livres*. The estimate of the expense of the canal du Midi, of which the length is 238,648 metres †, (notwithstanding the construction of 62 locks, and the magnificent reservoir of St. Ferreol) was only 4,897,000 francs ‡; but it has cost from 1686 to 1791 the sum of 22,999,000 of francs § to keep this canal in order ‖.

* 1,291,770*l.* sterling. *Trans.* † 782,966 feet. *Trans.*
‡ 204,057*l.* sterling. *Trans.* § 958,368*l.* sterling. *Trans.*
‖ Andreossy, *Histoire du Canal du Midi*, p. 289.

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Resuming what we have been stating relative to the hydraulical operations carried on in the plains of Mexico, we see that the safety of the capital actually depends: 1. on the stone dikes which prevent the water of the lake of Zumpango from flowing over into the lake of San Christobal, and San Christobal from flowing into the lake of Tezcuco; 2. on the dikes and sluices of Tlahuac and Mexicaltzingo, which prevent the lakes of Chalco and Xochimilco from overflowing; 3. on the desague of Enrico Martinez, by which the Rio de Guautitlan makes its way through the mountains into the valley of Tula; and, 4. on the two canals of M. Mier, by which the two lakes of Zumpango and San Christobal may be thrown dry at pleasure.

However, all these multiplied means do not secure the capital against inundations proceeding from the north and north-west. Notwithstanding all the expense which has been laid out, the city will continue exposed to very great risks till a canal shall be immediately opened from the lake of Tezcuco. The waters of this lake may rise, with-

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out those of San Christobal bursting the dike which confines them. The great inundation of Mexico under the reign of Ahuitzotl was solely occasioned by frequent rains*, and the overflowing of the most southern lakes, Chalco and Xochimilco. The water rose to five or six metres† above the level of the streets. In 1763, and the beginning of 1764, the capital was from a similar cause in the greatest danger. Inundated in every quarter it formed an island for several months, without a single drop from the Rio de Guautitlan entering the lake of Tezcuco. This overflow was merely occasioned by small confluents from the east, west and south. Water was every where seen to spring up, undoubtedly from the hydrostatical

*The Indian historians relate, that at this period great masses of water were seen to fall on the declivities of the mountains in the interior of the country, which contained fishes never found but in the rivers of the warm regions (*pescados de tierra caliente*); a physical phenomenon difficult of explanation, on account of the elevation of the Mexican table-land.

† 16 and 19 feet. *Trans.*

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pression which it experienced in filtration in the surrounding mountains. On the 6th of September, 1772, there fell* so sudden and abundant a shower in the valley of Mexico, that it had all the appearance of a water spout (*manga de agua*). Fortunately, however, this phenomenon took place only in the north and north-west part of the valley. The canal of Huehuetoca was then productive of the most beneficial effects, though a great portion of ground between San Christobal, Ecatepec, San Mateo, Santa Iñes, and Guautitlan, were inundated to such a degree that many edifices became entire ruins. If this deluge had burst above the basin of the lake of Tezcuco, the capital would have been exposed to the most imminent danger. These circumstances, and several others which we have already adverted to, sufficiently prove how indispensable a duty it becomes for the government to take in hand the draining the lakes which are nearest to the city of Mexico. This necessity

* *Informe de Velasquez* (manuscript), folio 25.

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is daily increasing, because the bottoms of the basins of Tezcuco and Chalco are continually becoming more elevated from the depositions which they receive.

In fact, while I was at Huehuetoca in the month of January, 1804, the viceroy Iturrigaray gave orders for the construction of the canal of Tezcuco, formerly projected by Martinez, and more recently surveyed by Velasquez. This canal, the estimate of the expense of which amounts to three millions of livres tournois*, is to commence at the north-west extremity of the lake of Tezcuco, in a point situated at a distance of 4593 metres † south 36° east, from the first sluice of the Calzada de San Christobal. It is to pass, first, through the great arid plain containing the insulated mountains of *las Cruces de Ecatepec* and *Chiconautla* ‡, and it will

* 125,010*l.* sterling. *Trans.* † 15,067 feet. *Trans.*

‡ The former of these summits, according to the geodesical measurements of M. Velasquez, is 404, and the latter 378 Mexican varas (339 and 317 metres) above the mean level of the lake of Tezcuco.

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then take the direction of the farm of Santa Iñes towards the canal of Huehuetoca. Its total length to the sluice of Vertideros will be 37,978 Mexican varas, or 31,901 metres *; but what will render the execution of this plan the most expensive, is the necessity of deepening the course of the old desague all the way from Vertideros to beyond the Boveda Real; the first of these two points being 9^m, 078 above, and the second 9^m, 181 † lower than the mean level of the lake of Tezcuco ‡.

* 104,660 feet. *Trans.*

† 357.108 inches, and 361.464 inches. *Trans.*

‡ To complete the description of this great hydraulical undertaking, we shall here insert the principal results of M. Velasquez's survey. These results, on correcting the error of the refraction, and reducing the apparent to the true level, coincide well enough with those obtained by Enrico Martinez and Arias in the commencement of the 17th century; but they prove the erroneousness of the surveys executed in 1764 by Don Ildefonso Yniesta, according to which the draining of the lake of Tezcuco appeared a much more difficult problem to resolve than it is in reality. We shall designate by + the points which are more elevated, and by — the points which

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Their distance from one another is almost 10200 metres (33464 feet English). To avoid deepen-

are less elevated than the mean level of the water of Tezcuco, in 1773 and 1774, or the signal placed near its bank, at the distance of 5475 Mexican varas, south 36° east from the first sluice of the Calzada de San Christobal.

		Varas.	Palmos.	Dedos.	Granos.
The channel of the Rio de Guautitlan near the sluice of Vertideros - -	+	10	3	2	3
The channel of the desague under the port of Huehuetoca - - -	+	8	0	2	1
Id. near the sluice of Santa Maria - - -	+	4	2	8	3
Id. below the sluice of Valderas - - -	+	2	1	11	2
The channel of the desague below the Boveda Real	—	10	3	9	3
Id. below the Boveda de Techo Baxo - -	—	15	0	6	1
Id. below the Bocca de San Gregorio - - -	—	23	1	11	2
Id. above the Salto del Rio	—	90	1	9	0
Id. below the Salto del Rio	—	107	2	9	0

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ing the bed of the present desague for a still more considerable length, it is proposed to give to the new canal a fall of only 0^m, 2 in 1000 metres. The plan of the engineer Martinez was rejected in 1607, purely because it was supposed that a current ought to have a fall of half a metre in the hundred. Alonso de Arias then proved on the authority of Vitruvius (L. VIII. C. 7.), that to convey the water of the lake of Tezcuco into the Rio de Tula a prodigious depth would be requisite for the new canal, and that even at the foot of the cascade near the Hacienda del Salto, the

It is to be observed that the vara is divided into 4 palmos, 48 dedos, and 192 granos; that a toise is equal to 3.32258 Mexican varas, and that a Mexican vara is .839169 metres, according to the experiments made on a vara preserved in the *Casa del Cabildo* of Mexico since the time of king Philip II. *Author.*

A toise is equivalent to 2.32258 Mexican varas, and not 3.32258. A vara being equal to .839169 of a metre, 2.32258 varas correspond to 1.949 metres = 6.394 English feet = 1 toise. *Trans.*

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level of its water would be 200 metres* below the river. Martinez could not stand against the power of prejudices and the authority of the ancients! We think that if it is prudent to give little inclination to canals of navigation, it is useful to give in general a good deal to canals of desiccation; but there are particular cases where the nature of the ground will not admit in hydraulical operations of all the advantages which theory may prescribe.

When we take into consideration the expense of the excavations required in the Rio del Desague, from the sluice of Vertideros or that of Valderas to the Boveda Real, we are tempted to believe that it would be, perhaps, easier to secure the capital from the dangers with which it is still threatened by the lake of Tezcuco, by recurring to the project attempted to be carried into execution by Simon Mendez during the great inundation from 1629 to 1634. M. Velasquez examined this project in 1774. After surveying the ground,

* 656 feet. *Trans.*

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that geometrician affirmed that 28 pits of ventilation, and a subterraneous gallery of 13000 metres* in length, for bringing the water of Tezcuco across the mountain of Citlaltepec towards the river of Tequixquiac, could be sooner finished, and at less expense, than the enlarging the bed of the desague, deeping it for a course of more than 9000 metres†, and cutting a canal from the lake of Tezcuco to the sluice of Vertideros near Huehuetoca. I was present at the consultations which took place in 1804 before deciding that the water of Tezcuco should pass through the old cut of Nochistongo. The advantages and disadvantages of Mendez's project were never discussed in these conferences.

It is to be hoped that in digging the new canal of Tezcuco more attention will be paid to the situation of the Indians than has hitherto been done, even so late as 1796 and 1798, when the courses of Zumpango and San Christobal were executed. The Indians entertain the most bitter hatred

* 42,650 feet. *Trans.* † 29,527 feet. *Trans.*

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against the desague of Huehuetoca. A hydraulical operation is looked upon by them in the light of a public calamity, not only because a great number of individuals have perished by unfortunate accidents in Martinez's operations, but especially because they were compelled to labour to the neglect of their own domestic affairs, so that they fell into the greatest indigence while the desiccation was going on. Many thousands of Indian labourers have been almost constantly occupied in the desague for two centuries; and it may be considered as a principal cause of the poverty of the Indians in the valley of Mexico. The great humidity to which they were exposed in the trench of Nochistongo gave rise to the most fatal maladies among them. Only a very few years ago the Indians were cruelly bound with ropes, and forced to work like galley slaves, even when sick, till they expired on the spot. From an abuse of law, and especially from an abuse of the principles introduced since the organization of intendancies, the work at the desague of Huehuetoca is looked upon

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as an extraordinary *corvée*. It is a personal service exigible from the Indian, a remain of the *mita**, which we should not expect in a country where the working of the mines is perfectly voluntary, and where the Indian enjoys more personal liberty than in the north-east part of Europe. In turning the attention of the viceroy to these important considerations, I could have referred to the numerous testimonies contained in the *Informe de Zepeda*. In every passage of it we read "that the desague has diminished the population and prosperity of the Indians, and that such or such a hydraulical project dare not be carried into execution, because the engineers have no longer so great a number of engineers at their disposal as in the time of the viceroy Don Luis de Velasco the Se-

* See above, chap. V. The Indian is paid at the desague at the rate of two reals of *plata*, or 25 sous per day (=1*s*. 0½*d*.). In Martinez's time, in the 17th century, the Indians were only paid at the rate of 5 reals or 3 francs per week (=2*s*. 6*d*.), but they also received a certain quantity of maize for their maintenance.

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cond." It is consoling, however, to observe, as we have already endeavoured to explain in the beginning of the fourth chapter, that this progressive depopulation has only taken place in the central part of the old Anahuac.

In all the hydraulical operations of the valley of Mexico, water has been always regarded as an enemy, against which it was necessary to be defended either by dikes or drains. We have already proved that this mode of proceeding, especially the European method of artificial desiccation, has destroyed the germ of fertility in a great part of the plain of Tenochtitlan. Efflorescences of carbonate of soda *(tequesquite)* have increased in proportion as the masses of running water have diminished. Fine savannas have gradually assumed the appearance of arid steppes. For great spaces the soil of the valley appears merely a crust of hardened clay *(tepetate)*, destitute of vegetation, and cracked by contact with the air. It would have been easy, however, to profit by the natural advantages of the ground, in applying the same canals for the

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drawing of water from the lakes for watering of the arid plains, and for interior navigation. Large basins of water ranged as it were in stages above one another facilitate the execution of canals of irrigation. To the south-east of Huehuetoca are three sluices, called *los Vertideros*, which are opened when the Rio de Guautitlan is wished to be discharged into the lake of Zumpango, and the Rio del Desague to be thrown dry for the sake of cleaning or deepening the course. The channel of the old mouth of the Rio de Guautitlan, that which existed in 1607, having become gradually obliterated, a new canal has been cut from Vertideros to the lake of Zumpango. In place of continually drawing the water from this lake, and from San Christobal, out of the valley towards the Atlantic Ocean, in the interval of 18 or 20 years, during which no extraordinary rise takes place, the water of the desague might have been distributed to the great advantage of agriculture in the lower parts of the valley. Reservoirs of water might have been constructed for seasons of drought.

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It was thought preferable, however, blindly to follow the order issued from Madrid, which bears, "that not a drop of water ought to enter into the lake of Tezcuco from the lake of San Christobal, unless once a year, when the sluices (*las compuertas de la Calzada*) are opened for the sake of fishing* in the basin of San Christobal." The trade of the Indians of Tezcuco languishes for whole months from the want of water in the salt lake which separates them from the capital; and districts of ground lie below the mean level of the water of Guautitlan and of the northern lakes; and yet no idea has ever been entertained for ages of supplying the wants of agriculture and interior navigation. From a remote period there was a small canal (*sanja*) from the lake of Tezcuco to the lake of

* This fishing is a grand rural festival for the inhabitants of the capital. The Indians construct huts on the banks of the lake of San Christobal, which is thrown almost dry during the fishing. This bears some resemblance to the fishing which Herodotus relates the Egyptians carried on twice a year in the lake Moeris, on opening the sluices of irrigation.

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San Christobal. A lock of four metres* of fall would have admitted canoes from the capital to the latter of these lakes; and the canals of M. Mier would have even conducted them to the village of Huehuetoca. In this manner a communication would have been established from the south bank of the lake of Chalco to the northern bounds of the valley, for an extent of more than 80000 metres †. Men of the best information, animated with the noblest patriotic zeal, have had the courage to propose these measures ‡; but the government, by rejecting the best conceived projects for such a length of time, seems to be resolved to consider the water of the Mexican lakes merely as a destructive element, from which the environs of the capital must be freed, and to which no other course ought to be permitted than that towards the Atlantic Ocean.

* 13 feet. *Trans.* † 262,468 feet. *Trans.*

‡ M. Velasquez, for example, at the end of his *Informe sobre el Desague* (MS.).

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Now that the canal of Tezcuco, by order of the viceroy Don Josef de Iturrigaray, is to be opened, there will remain no obstacle to a free navigation through the large and beautiful valley of Tenochtitlan. Corn and the other productions of the districts of Tula and Guautitlan will come by water to the capital. The carriage of a mule load, estimated at 300 pounds weight, costs from Huehuetoca to Mexico five reals*, or four francs †. It is computed that when the navigation will be set on foot, the freight of an Indian canoe of 15,000 pounds burden will not be more than four or five piastres ‡, so that the carriage of 300 pounds (which make a *carga*) will only cost nine sous §. Mexico, for example, will get lime at six or seven

* A double piastre contains 8 reals de Plata, and in works on the Spanish colonies and America, *Pesos fuertes*, and Reales de Plata, are always understood.

† 4 francs = 3*s.* 4*d.*, but according to the data of our author 5 reals amount only to 2*s.* 8¾*d.* *Trans.*

‡ 17*s.* 6*d.* or 1*l.* 1*s.* 10*d.* sterling. *Trans.* § 4¼*d.* *Trans.*

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piastres* the cart load (*carretada*), while the present price is from 10 to 12 piastres†.

But the most beneficial effect of a navigable canal from Chalco to Huehuetoca will be experienced in the commerce of the interior of New Spain, known by the name of *Comercio de tierra adentro*, which goes in a straight line from the capital to Durango, Chihuahua, and Santa Fe, in New Mexico. Huehuetoca may hereafter become the emporium of this important trade, in which from fifty to sixty thousand beasts of burden (*recuas*) are constantly employed. The muleteers (*arrieros*) of New Biscay and Santa Fe fear nothing so much in the whole road of 500 leagues as the journey from Huehuetoca to Mexico. The roads in the north-west part of the valley, where the basaltic amygdaloid is covered with a large stratum of clay, are almost impassable in the rainy season. Many mules perish in them.

* 1*l.* 6*s.* 3*d.* or 1*l.* 10*s.* 7*d.* *Trans.*

† From 2*l.* 3*s.* 9*d.* to 2*l.* 12*s.* 6*d.* *Trans.*

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Those which stand out cannot recover from their fatigues in the environs of the capital, where there is no good pasturage and no large commons (*ejidos*), which Huehuetoca would easily supply. It is only by remaining some length of time in countries where all commerce is carried on by caravans, either of camels or mules, that we can correctly appreciate the influence of the objects under discussion on the prosperity and comfort of the inhabitants.

The lakes situated in the southern part of the valley of Tenochtitlan throw off from their surface miasmata of sulphuretted hydrogen, which become sensible in the streets of Mexico every time the south wind blows. This wind is therefore considered in the country as extremely unhealthy. The Aztecs in their hieroglyphical writings represented it by a death's head. The lake of Xochimilco is partly filled with plants of the family of the junci and cyperoides, which vegetate at a small depth under a bed of stagnating

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water. It has been recently proposed* to the government to cut a navigable canal in a straight line from the small town of Chalco to Mexico, a canal which would be shorter by a third than the present one; and it has at the same time been projected to drain the basins of the lakes of Xochimilco and Chalco, and sell the ground, which from having been for centuries washed with fresh water is uncommonly fertile. The centre of the lake of Chalco being somewhat deeper than the lake of Tezcuco, its water will never be completely drawn off. Agriculture and the salubrity of the air will be equally improved by the execution of M. Castera's project; for the south extremity of the valley possesses in general the soil best adapted for cultivation. The carbonate and muriate of soda are less abundant from the continual filtrations occasioned by the numerous rills which descend from the Cerro d'Axusco, the Guarda, and the volcanos. It must not, however, be forgotten

* Informe de Don Ignacio Castera (MS.), folio 14.

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that the draining of the two lakes will have a tendency to increase still farther the dryness of the atmosphere in a valley where the hygrometer of Deluc* frequently descends to fifteen. This evil is inevitable, if no attempt is made to connect these hydraulical operations with some general system; the multiplying at the same time canals of irrigation, forming reservoirs of water for times of drought, and constructing sluices for the sake of counteracting the different pressures of the inequality of levels, and for receiving and withholding the increases of the rivers. These reservoirs of water distributed at suitable elevations might be employed at the same time in cleaning and working periodically the streets of the capital.

In the epocha of a nascent civilization, gigantic projects are much more seductive than more sim-

* The temperature of the air being 23° centigrades, the 15° of Deluc's hygrometer are equivalent to 42° of the hygrometer of Saussure. The cause of this extreme dryness is discussed by me in the *Tableau physique des regions equinoxiales*, annexed to my *Essai, sur la geographie des plantes*, page 98.

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ple ideas of easier execution. Thus, in place of establishing a system of small canals for the interior navigation of the valley, the minds of the inhabitants have been bewildered since the time of the viceroy Count Revillagigedo with vague speculations on the possibility of a communication by water between the capital and the port of Tampico. Seeing the water of the lakes descend by the mountains of Nochistongo into the Rio de Tula (called also Rio de Moctezuma), and by the Rio de Panuco into the gulf of Mexico, they entertain the hope of opening the same route to the commerce of Vera Cruz. Goods to the value of more than 100 millions of livres* are annually transported on mules from the Atlantic coast over the interior table-land, while the flour, hides, and metals descend from the central table-land to Vera Cruz. The capital is the emporium of this immense commerce. The road, which, if no canal is attempted, is to be carried from the coast to Pe-

* 4,167,000*l.* sterling. *Trans.*

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
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rote, will cost several millions of piastres. Hitherto the air of the port of Tampico has appeared not so prejudicial to the health of Europeans and the inhabitants of the cold regions of Mexico as the climate of Vera Cruz. Although the bar of Tampico prevents the entry of vessels into the port drawing more than from 45 to 60 decimetres water*, it would still be preferable to the dangerous anchorage among the shallows of Vera Cruz. From these circumstances a navigation from the capital to Tampico would be desirable, whatever expense might be requisite for the execution of so bold an undertaking.

But it is not the expense which is to be feared

* From 14.763, say 14¾ feet, to 19.615 = 19 feet 8 inches. M. Humboldt observes, vol. I. p. 82. "that the coast of New Spain from the 18° to the 26° of latitude abounds with bars; and vessels which draw more than 32 centimetres (i. e. 12⅝ inches) of water cannot pass over any of these bars without danger of grounding." How does the bar of Tanpico then, which is within these latitudes, admit of vessels drawing 14 and 19 feet water? *Trans.*

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
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in a country where a private individual, the Count de la Valenciana, dug in a single mine * three pits at an expense of eight millions and a half of francs†. Nor can we deny the possibility of carrying a canal into execution from the valley of Tenochtitlan to Tampico. In the present state of hydraulical architecture boats may be made to pass over elevated chains of mountains, wherever nature offers points of separation which communicate with two principal recipients. Many of these points have been indicated by General Andreossy in the Vosges and other parts of France ‡. M. de Piony made a calculation of the time that a boat would take to pass the Alps, if by means of the lakes situated near the hospital of Mount Cenis a communication were established by water between Lans-le-bourg and the valley of Suze. This illustrious engineer proved by his calculation how much, in that particular case, land carriage was

* Near Guanaxuato. † 354,195*l.* sterling. *Trans.*
‡ Andreossy, *sur le Canal du Midi.*

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
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to be preferred to the tediousness of locks. The inclined planes, invented by Reynolds, and carried to perfection by Fulton, and the locks of MM. Huldleston and Betancourt, two conceptions equally applicable to the system of small canals, have greatly multiplied the means of navigation in mountainous countries. But however great the economy of water and time at which we can arrive, there is a certain maximum of height in the predominant point beyond which water is no longer preferable to land carriage. The water of the lake of Tezcuco, east from the capital of Mexico, is more than 2276 metres * elevated above the level of the sea, near the port of Tampico! Two hundred locks would be requisite to carry boats to so enormous a height. If on the Mexican canal the levels were to be distributed, as in the *Canal du Midi*, the highest point of which (at Naurouse) has only a perpendicular elevation of 189 metres †, the number of locks would amount to 330 or 340.

* 7465 feet. *Trans.* † 620 feet. *Trans.*

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I know nothing of the bed of the Rio de Moctezuma beyond the valley of Tula (the ancient Tollan); and I am ignorant of its partial fall from the vicinity of Zimapan and the Doctor. I recollect, however, that in the great rivers of South America canoes ascend without locks for distances of 180 leagues, against the current, either by towing or rowing to elevations of 300 metres *; but notwithstanding this analogy, and that of the great works executed in Europe, I can hardly persuade myself that a navigable canal from the plain of Anahuac to the Atlantic coast is a hydraulical work, the execution of which is anywise advisable.

The following are the remarkable towns (*ciudades y villas*) of the intendancy of Mexico:

	Population.
Mexico, capital of the kingdom of New Spain, height 2,277 metres †.	137,000

* 984 feet. *Trans.* † 7470 feet. *Trans.*

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Population.

Tezcuco, which formerly possessed very considerable cotton manufactories. They have suffered much, however, in a competition with those of Queretaro 5,000

Cuyoacan, containing a convent of nuns, founded by Hernan Cortez, in which, according to his testament, the great captain wished to be interred, "in whatever part of the world he should end his days." We have already stated that this clause of the testament was never fulfilled.

Tacubaya, west from this capital, containing the archbishop's palace and a beautiful plantation of European olive-trees

Tacuba, the ancient Tlacopan, capital of a small kingdom of the Tepanecs.

Cuernavaca, the ancient Quauhnahuac, on the south declivity of the Cordillera of Guchilaque, in a temperate and

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Population.

delicious climate, finely adapted for the cultivation of the fruit-trees of Europe. Height * 1655 metres †.

Chilpansingo (Chilpantzinco), surrounded with fertile fields of wheat. Elevation 1080 metres ‡.

Tasco (Tlachco), containing a beautiful parish church, constructed and endowed towards the middle of the 18th century

* 5429 feet. *Trans.*

† M. Alzate affirms, in the Literary Gazette, published at Mexico (1760, p. 220), that the absolute height of places has very little influence in New Spain on the temperature. He cites as an example the city of Cuernavacca, which, according to him, is at the same height above the level of the sea with the capital of Mexico, and which only owes its delicious climate to its position south of a high chain of mountains. But M. Alzate has fallen into an error of more than 600 metres in the elevation of Cuernavacca. Cortez, who changes all the names of the Aztec language, calls this town *Coadnabaced*, a word in which we can with difficulty recognize Quauhnahuac. (*Carta de Relacion al Emperador Don Carlos*, paragraph 19.

‡ 3542 feet. *Trans.*

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
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Population.

by Joseph de Laborde, a Frenchman, who gained immense wealth in a short time by the Mexican mines. The building of this church alone cost this individual more than two millions of francs *. Towards the end of his career, being reduced to great poverty, he obtained from the archbishop of Mexico permission to sell for his benefit to the metropolitan church of the capital the magnificent *custodia* set with diamonds, which, in better times, he had offered through devotion to the tabernacle of the parish church of Tasco. Elevation of the city, 783 metres †.

Acapulco (Acapolco), at the back of a chain of granitical mountains, which, from the reverberation of the radiating caloric, increase the suffocating heat of the climate. The famous cut in the

* 83,340*l.* sterling. *Trans.*

† 2567 feet. *Trans.*

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No of Inhabitants to the square League.
I. Intendancy of Mexico.	1,511,800	5,927	255

Population.

mountain (*abra de San Nicolas*), near the bay *de la Langosta*, for the admission of the sea winds, was recently finished. The population of this miserable town, inhabited almost exclusively by people of colour, amounts to 9000, at the time of the arrival of the Manilla galleon (*Nao de China*).—Its habitual population is only 4.000

Zacatula, a small sea-port of the South Sea, on the frontiers of the intendancy of Valladolid, between the ports of Siguantanejo and Colima.

Lerma, at the entry of the valley of Toluca, in a marshy ground.

Toluca (Tolocan) at the foot of the porphyry mountain of San Miguel de Tutucuitlalpilco, in a valley abounding with maize and maguey (agave).—Height 2687 metres*.

* 8813 feet. *Trans.*

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Population.

Pachuca, with Tasco the oldest mining-place in the kingdom, as the neighbouring village, Pachuquillo, is supposed to have been the first christian village founded by the Spaniards.—Height 2482 metres *.

Cadereita, with fine quarries of porphyry of a clay base *(thonporphyr)*.

San Juan del Rio, surrounded with gardens, adorned with vines and anona. Height 1978 metres †.

Queretaro, celebrated for the beauty of its edifices, its aqueduct, and cloth manufactures. Height 1940 metres‡. Habitual population, 35,000

This city contains 11,600 Indians, 85 secular ecclesiastics, 181 monks, and 143 nuns. The consumption of Queretaro amounted in 1793 § to

* 8141 feet. *Trans.* † 6489 feet. *Trans.*

‡ 6374 feet. *Trans.*

§ *Notitia del Doctor Don Juan Ignacio Briones* (M. S.).

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
I. Intendancy of Mexico.	1,511,800	5,927	255

13,618 cargas of wheaten flour, 69,445 fanegas of maize, 656 cargas of chile (capsicum), 1770 barrels of brandy, 1682 beeves, 14949 sheep, and 8869 hogs.

The most important mines of this intendancy, considering them only in the relation of their present wealth, are:

La Veta Biscaina de Real del Monte, near *Pachuca*; *Zimapan*, *el Doctor*, and *Tehulilotepec*, near *Tasco*.

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
II. Intendancy of Puebla.	813,300	2,696	301

THIS intendancy, which has only a coast of 26 leagues towards the Great Ocean, extends from the 16° 57′ to the 20° 40′ of north latitude, and is consequently wholly situated in the torrid zone. It is bounded on the north-east by the intendancy of Vera Cruz, on the east by the intendancy of Oaxaca, on the south by the ocean, and on the west by the intendancy of Mexico. Its greatest length, from the mouth of the small river Tecoyame to near Mexitlan, is 118 leagues, and its greatest breadth from Techuacan to Mecameca is 50 leagues.

The greater part of the intendancy of Puebla is traversed by the high cordilleras of Anahuac. Beyond the 18th degree of latitude the whole country is a plain eminently fertile in wheat, maize, agave, and fruit trees. This plain is from 1800 to 2000 metres * above the level of the ocean. In this intendancy is also the most elevated mountain of all New Spain, the Popocatepetl. This volcano,

* From 5905 to 6561 feet. *Trans.*

STATISTICAL ANALYSIS. } II. *Intendancy of Puebla.*

first measured by me, is continually burning; but for these several centuries it has thrown nothing up from its crater but smoke and ashes. This mountain is 600 metres* higher than the most elevated summit of the old continent. From the isthmus of Panama to Bering's Straits, which separate Asia from America, we know only of one mountain, *Mont St. Elie*, higher than the great volcano of Puebla.

The population of this intendancy is still more unequally distributed than that of the intendancy of Mexico. It is concentrated on the plain which extends from the eastern declivity of the *Nevados*† to the environs of Perote, especially on the high and beautiful plains between Cholula, La Puebla, and Tlascala. Almost the whole country, from the central table-land towards San Luis and Ygualapa, near the South Sea coast, is desert, though

* 1968 feet. *Trans.*

† The words *Nevado* and *Sierra Nevada* do not mean in Spanish mountains which from time to time are covered with snow in summer, but summits which enter the region of perpetual snow. I prefer this foreign word to the length of periphrases, or the improper expression of snowy mountains, sometimes used by the academicians sent to Peru. Moreover, the word Nevado, when it is joined to the name of a mountain, gives an idea of the minimum of height attributable to its summit. (See *Recueil de mes Observations Astronomiques*, Vol. I. p. 134.)

well adapted for the cultivation of sugar, cotton, and the other precious productions of the tropics.

The table-land of La Puebla exhibits remarkable vestiges of ancient Mexican civilization. The fortifications of Tlaxcallan are of a construction posterior to that of the great pyramid of Cholula, a curious monument, of which I shall give a minute description in the historical account of my travels in the interior of the new continent. It is sufficient to state here, that this pyramid, on the top of which I made a great number of astronomical observations, consists of four stages; that in its present state the perpendicular elevation is only 54 metres *, and the horizontal breadth of the base 439 metres †; that its sides are very exactly in the direction of the meridians and parallels, and that it is constructed (if we may judge from the perforation made a few years ago in the north side) of alternate strata of brick and clay. These data are sufficient for our recognizing in the construction of this edifice the same model observed in the form of the pyramids of Teotihuaccan, of which we have already spoken. They suffice also to prove the great analogy ‡ between these brick

* 177 feet. *Trans.* † 1423 feet. *Trans.*

‡ *Zoega de Obeliscis*, p. 380; *Voyages de Pococke (edition de Neufchatel)*, 1752, tom. i. p. 156 and 167; *Voyage de De-*

STATISTICAL ANALYSIS. } II. *Intendancy of Puebla.*

monuments erected by the most ancient inhabitants of Anahuac, the temple of Belus at Babylon, and the pyramids of Mensichich-Dashour, near Sakhara in Egypt.

The platform of the truncated pyramid of Cholula has a surface of 4200 square metres *. In the midst of it there is a church dedicated to Nuestra Señora de los Remedios, surrounded with cypress, in which mass is celebrated every morning by an ecclesiastic of Indian extraction, whose habitual abode is the summit of this monument. It is from this platform that we enjoy the delicious and majestic view of the Volcan de la Puebla, the Pic d'Orizaba, and the small cordillera of Matlacueye†, which formerly separated the territory of the Cholulans from that of the Tlaxcaltec republicans.

The pyramid, or teocalli, of Cholula is exactly of the same height as the Tonatiuh Itzaqual of Teotiuhacan, already described; and it is three metres‡ higher than the Mycerinus, or the third of the great Egyptian pyramids of the groupe of Ghize.

non, 4to. edit. p. 86, 194, and 237; *Grobert Description des Pyramides*, p. 6 and 12.

* 45,206 square feet English. *Trans.*

† Called also the Sierra *Malinche*, or *Doña Maria*. Malinche appears to be derived from *Malintzin*, a word (I know not why) which is now the name of the Holy Virgin.

‡ 9.8 feet. *Trans.*

STATISTICAL ANALYSIS. } II. *Intendancy of Puebla.*

As to the apparent length of its base, it exceeds that of all the edifices of the same description hitherto found by travellers in the old continent, and is almost the double of the great pyramid known by the name of Cheops. Those who wish to form a clear idea of the great mass of this Mexican monument from a comparison with objects more generally known, may imagine a square four times the dimensions of the Place Vendome, covered with a heap of bricks of twice the elevation of the Louvre! The whole of the interior of the pyramid of Cholula is not, perhaps, composed of brick.—These bricks, as was suspected by a celebrated antiquary at Rome, M. Zoëga, probably form merely an incrustation of a heap of stones and lime, like many of the pyramids of Sakhara, visited by Pocock, and more recently by M. Grobert*. Yet the road from Puebla to Mecameca, carried across a part of the first stage of the teocalli, does not agree with this supposition.

We know not the ancient height of this extraordinary monument. In its present state, the length of its base† is to its perpendicular height

* See note E at the end of the work.

† I shall here subjoin the true dimensions of the three great pyramids of Ghize, from the interesting work of M. Grobert. I shall place in adjoining columns the dimensions of the brick pyramidal monuments of Sackhara in Egypt, and of

STATISTICAL ANALYSIS. } II. *Intendancy of Puebla.*

as 8 : 1; while in the three great pyramids of Ghize, this proportion is as $1\frac{6}{10}$ and $1\frac{7}{10}$ to 1, or nearly as 8 to 5. We have already observed that the

Teotihuacan and Cholula in Mexico. The numbers are French feet. (A French foot = 1.066 English.)

	Stone pyramids.			Brick pyramids.		
	Cheops.	Cephren.	Mycerinus.	Of Five Stages in Egypt, near Sakhara.	Of Four Stages in Mexico. Teotihuacan.	Of Four Stages in Mexico. Cholula.
Height.	448	398	162	150	171	172
Length of Base.	728	655	280	210	645	1355

It is curious to observe, 1. that the people of Anahuac have had the intention of giving the height and the double base of the Tonatiuh Itztaqual to the pyramid of Cholula; and 2. that the greatest of all the Egyptian pyramids, that of Asychis, of which the base is 800 feet in length, is of brick and not of stone (*Grobert*, p. 6). The cathedral of Strasbourg is eight feet, and the cross of St. Peter at Rome 41 feet, lower than the Cheops. There are in Mexico pyramids of several stages, in the forests of Papantla, at a small elevation above the level of the sea, and in the plains of Cholula and Teotihuacan at elevations surpassing those of our passes in the Alps. We are astonished to see in regions the most remote from one another, and under climates of the greatest diversity, man following the same model in his edifices, in his ornaments, in his habits, and even in the form of his political institutions.

houses of the sun and moon, or the pyramidal monuments of Teotihuacan north-east from Mexico, are surrounded with a system of small pyramids arranged symmetrically. M. Grobert has published a very curious drawing of the equally regular disposition of the small pyramids which surround the Cheops and Mycerinus at Ghize. The teocalli of Cholula, if it is allowable to compare it with these great Egyptian monuments, appears to have been constructed on an analogous plan. We still discover on the western side, opposite the cerros of Tecaxete and Zapoteca, two completely prismatical masses. One of these masses now bears the name of Alcosac, or Istenenetl, and the other that of the Cerro de la Cruz. The elevation of the latter, which is constructed *en pisé*, is only 15 metres*.

The intendancy of Puebla gratifies the curiosity of the traveller also with one of the most ancient monuments of vegetation. The famous ahahuete †, or cypress of the village of Atlixco, is 23m. 5‡, or 73 feet in circumference. Measured interiorly (for its trunk is hollow) the diameter is 15 feet §. This cypress of Atlixco is, therefore, to

49 feet. *Trans.* † Cupressus disticha. *Lin.*

76.4 feet English. *Trans.* § 16 feet English. *Trans.*

STATISTICAL ANALYSIS. } II. *Intendancy of Puebla.*

within a few feet, of the same thickness * as the baobab (Adansonia digitata) of the Senegal.

The district of the old republic of Tlaxcalla, inhabited by Indians jealous of their privileges, and very much inclined to civil dissensions, has for a long time formed a particular government. I have indicated it in my general map of New Spain as still belonging to the intendancy of Puebla; but by a recent change in the financial administration, Tlaxcalla and Guautla de las Hamilpas were united to the intendancy of Mexico, and Tlapa and Ygualapa separated from it.

There were in *1793*, in the intendancy of Puebla, without including the four districts of Tlaxcalla, Guautla, Ygualapa, and Tlapa:

Indians,	Males	187,531 souls.
	Females	186,221
Spaniards or whites,	Males	25,617
	Females	29,363
Mixed race,	Males	37,318
	Females	40,590
Secular ecclesiastics		585
Monks		446
Nuns		427

Result of the total enumeration, 508,028 souls,

* See as to the antiquity of the vegetable species my memoir on the physiognomy of plants, in my *Tableaux de la Nature*, tom. II. p. 108 and 137.

STATISTICAL ANALYSIS. } II. *Intendancy of Puebla.*

distributed into 6 cities, 133 parishes, 607 villages, 425 farms (*haciendas*), 886 solitary houses (*ranchos*), and 33 convents, two-thirds of which are for monks.

The government of Tlaxcalla contained in 1793 a population of 59,177 souls, whereof 21,849 were male and 21,029 female Indians. The boasted privileges of the citizens of Tlaxcallan are reducible to the three following points: 1. The town is governed by a cacique and four Indian alcaldes, who represent the ancient heads of the four quarters, still called Tecpectipac, Ocotelolco, Quiahutztlan, and Tizatlan. These alcaldes are under the dependance of an Indian governor, who is himself subject to the Spanish intendant. 2. The whites have no seat in the municipality, in virtue of a royal cedula of the 16th April, 1585; and 3. The cacique, or Indian governor, enjoys the honours of an *alferez real*.

The district of Cholula contained in 1793 a population of 22,423 souls. The villages amounted to 42, and the farms to 45. Cholula, Tlaxcalla, and Huetxocingo, are the three republics which resisted the Mexican yoke for so many centuries, although the pernicious aristocracy of their constitution left the lower people little more freedom than they would have possessed under the government of the Aztec kings.

The progress of the industry and prosperity of

STATISTICAL ANALYSIS. } II. *Intendancy of Puebla.*

this province has been extremely slow, notwithstanding the active zeal of an intendant equally enlightened and respectable, Don Manuel de Flon, who lately inherited the title of Count de la Cadena. The flour trade, formerly very flourishing, has suffered much from the enormous price of carriage from the Mexican table-land to the Havannah, and especially from the want of beasts of burden. The commerce which Puebla carried on till 1710 with Peru in hats and delft-ware has entirely ceased. But the greatest obstacle to the public prosperity arises from four-fifths of the whole property *(fincas)* belonging to mort-main proprietors; that is to say, to communities of monks, to chapters, corporations, and hospitals.

The intendancy of Puebla has very considerable salt-works near Chila, Xicotlan, and Ocotlan (in the district of Chiautla), as also near Zapotitlan. The beautiful marble, known by the name of Puebla marble, which is preferable to that of Bizaron, and the Real del Doctor, is procured in the quarries of Totamehuacan and Tecali, at two and seven leagues distance from the capital of the intendancy. The carbonate of lime of Tecali is transparent, like the gypsous alabaster of Volterra and the Phengites of the ancients.

The indigenous of this province speak three languages totally different from one another, the

Mexican, Totonac, and Tlapanec. The first is peculiar to the inhabitants of Puebla, Cholula, and Tlascalla; the second to the inhabitants of Zacatlan; and the third is preserved in the environs of Tlapa.

The most remarkable towns of the intendancy of Puebla are:

La Puebla de los Angeles, the capital of the intendancy, more populous than Lima, Quito, Santa Fe, and Caraccas; and after Mexico, Guanaxuato, and the Havannah, the most considerable city of the Spanish colonies of the new continent. La Puebla is one of the small number of American towns founded by European colonists; for in the plain of Acaxete, or Cuitlaxcoapan, on the spot where the capital of the province now stands, there were only in the beginning of the 16th century a few huts inhabited by Indians of Cholula. The privilege of the town of Puebla is dated 28th Sept. 1531. The consumption of the inhabitants in 1802 amounted to 52,951 cargas (of 300 pounds each) of wheaten flour, and 36,000 cargas of

STATISTICAL ANALYSIS. } II. *Intendancy of Puebla.*

Population.

maize. Height of the ground at the Plaza-Mayor 2196 metres *. 67,800

Tlascalla is so much reduced from its ancient grandeur, that it scarcely contains 3400 inhabitants, among whom there are not more than 900 Indians of pure extraction. Yet Hernan Cortez found a population in this place which appeared to him greater than that of Grenada. 3,400

Cholula, called by Cortez † Churulte-

* 7381 feet. *Trans.*

† This great conquistador, with a simplicity of style for which his writings are characterised, draws a curious picture of the old town of Cholula —"The inhabitants of this city," says he, in his third letter to the emperor Charles the Fifth, "are better clothed than any we have hitherto seen. People in easy circumstances wear cloaks *(albornoces)* above their dress. These cloaks differ from those of Africa, for they have pockets, though the cut, cloth, and fringes are the same. The environs of the city are very fertile and well cultivated. Almost all the fields may be watered, and the city is much more beautiful than all those in Spain, for it is well fortified, and built on very level ground. I can assure your highness, that from the top of a mosque *(mezquita*, by which Cortez designates the *teocalli)* I reckoned more than four hundred towers all of mosques. The number of the inhabitants is so great that there is not an inch of ground uncultivated; and yet in several places the Indians experience the effects of famine, and there are many beggars, who ask alms from the rich in the

STATISTICAL ANALYSIS. II. *Intendancy of Puebla.*

Population.

col, surrounded by beautiful plantations of agave. 16,000

Atlixco, justly celebrated for the fineness of its climate, great fertility, and the savoury fruits with which it abounds, especially the anona cheremolia, Lin. (*chilimoya*), and several sorts of passiflores (*parchas*), produced in the environs.

Tehuacan de las Granadas, the ancient Teohuacan de la Mizteca, one of the most frequented sanctuaries of the Mexicans before the arrival of the Spaniards.

Tepeaca, or *Tepeyacac*, belonging to the marquisate of Cortez. It was called in the commencement of the conquest *Segura de la Frontera* (Cartas de Hernan Cortez, p. 155). In the district of Tepeaca there is a pretty Indian village, now called Huacachula (the old (Quauhquechollan), situated in a valley abounding in fruit-trees.

streets, houses, and market-place, as is done by the mendicants in Spain and other civilized countries." (*Cartas de Cortez*, p. 69.) It is curious enough to observe that the Spanish general considers mendicity in the streets as a sign of civilization. He says, "*Gente que piden como hay en Espana y en otras partes que hay gente de razon.*"

STATISTICAL ANALYSIS. } II. *Intendancy of Puebla.*

Huajocingo, or *Huexotzinco*, formerly the chief town of a small republic of the same name, at enmity with the republics of Tlascalla and Cholula.

Whatever may be the depopulation of the intendancy of Puebla, its *relative population* is still four times greater than that of the kingdom of Sweden, and nearly equal to that of the kingdom of Arragon.

The industry of the inhabitants of this province is not much directed to the working of gold and silver mines. Those of Yxtacmaztitlan, Temeztla, and Alatlauquitepic, in the Partido de San Juan de los Llanos, of La Canada, near Tetela de Xonotla, and of San Miguel Tenango, near Zacatlan, are almost abandoned, or at least very remissly worked.

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
III. Intendancy of Guanaxuato.	517,300	911	586

THIS province, wholly situated on the ridge of the Cordillera of Anahuac, is the most populous in New Spain. The population is also more equally distributed here than in any of the other provinces. Its length, from the lake of Chapala to the north-east of San Felipe, is 52 leagues, and its breadth, from the Villa de Leon to Celaya, 31 leagues. Its territorial extent is nearly the same as that of the kingdom of Murcia; and in relative population it exceeds the kingdom of the Asturias. Its relative population is even greater than that of the departments of the *Hautes-Alpes*, *Basses-Alpes*, *Pyrenees Orientales*, and the *Landes*. The most elevated point of this mountainous county seems to be the mountain de los Llanitos in the Sierra de Santa Rosa. I found its height above the level of the sea 2815 metres *.

The cultivation of this fine province, part of the old kingdom of Mechoacan, is almost wholly to be ascribed to the Europeans, who arrived there in the

* 9235 feet. *Trans.*

STATISTICAL ANALYSIS. } III. *Intendancy of Guanaxuato.*

16th century, and introduced the first germ of civilization. It was in these northern regions, on the banks of the Rio de Lerma, formerly called Tolotlan, that the engagements took place between the tribes of hunters and shepherds, called in the historians by the vague denominations of Chichimecs, who belonged to the tribes of the Pames, Capuces, Samues, Mayolias, Guamanes, and Guachichiles Indians. In proportion as the country was abandoned by these wandering and warlike nations, the Spanish conquerors transplanted to it colonies of Mexican or Aztec Indians. For a long time agriculture made more considerable progress than mining. The mines, which were of small celebrity at the beginning of the conquest, were almost wholly abandoned during the seventeenth and eighteenth centuries; and it is not more than thirty or forty years since they became richer than the mines of Pachuca, Zacatecas, and Bolaños. Their metallic produce, as we shall hereafter explain, is now greater than the produce of Potosi or any other mine in the two continents ever was.

There are in the intendancy of Guanaxuato 3 *ciudades* (viz. Guanaxuato, Celaya, and Salvatierra); 4 *villas* (viz. San Miguel el Grande, Leon, San Felipe and Salamanca); 3 villages or *pueblos*; 33 parishes (*paroquias*); 44 farms or haciendas; 225 individuals of the secular clergy, 170 monks

and 30 nuns; and in a population of more than 180,000 Indians, 52,000 subject to tribute.

The most remarkable towns of this intendancy are the following:

	Population.
Guanaxuato, or Santa Fe de Gonnajoato. The building of this city was begun by the Spaniards in 1554. It received the royal privilege of *villa* in 1619; and that of *ciudad* the 8th December, 1741. Its present population is:	
Within the city (*en el casco de la ciudad*)	41,000
In the mines surrounding the city, of which the buildings are contiguous, at Marfil, Santa Ana, Santa Rosa, Valenciana, Rayas, and Mellado	29,600
	70,600

Among whom there are 4500 Indians. Height of the city at the Plaza Mayor 2084 metres*. Height of Valenciana at the mouth of the new pit (*tiro nuevo*) 2313 metres†. Height of Rayas at the mouth of the gallery 2157 metres‡.

Salamanca, a pretty little town, situated in a plain which rises insensibly by Temascatio, Burras, and Cuevas, towards Guanaxuato. Height 1757 metres‖.

* 6836 feet. *Trans.*
† 7586 feet. *Trans.*
‡ 7075 feet. *Trans.*
‖ 5762 feet. *Trans.*

STATISTICAL ANALYSIS. } III. *Intendancy of Guanaxuato.*

Celaya. Sumptuous edifices have recently been constructed at Celaya, Queretaro, and Guanaxuato. The church of the Carmelites at Celaya has a fine appearance. It is adorned with Corinthian and Ionic columns. Height 1835 metres*.

Villa de Leon, in a plain eminently fertile in grain. From this town to San Juan del Rio are to be seen the finest fields of wheat, barley, and maize.

San Miguel el Grande, celebrated for the industry of its inhabitants, who manufacture cotton cloth.

The hot wells of San Jose de Comangillas are in this province. They issue from a basaltic opening. The temperature of the water, according to experiments made jointly by myself and M. Roxas, is 96°, 3 of the centigrade thermometer †.

* 6018 feet. *Trans.* † 205°, 3 of Fahrenheit. *Trans.*

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
IV. Intendancy of Valladolid.	376,400	3,446	109

THIS intendancy at the period of the Spanish conquest made a part of the kingdom of Michuacan (Mechoacan), which extended from the Rio de Zacatula to the port de la Navidad, and from the mountains of Xala and Colima to the river of Lerma, and the lake of Chapala. The capital of this kingdom of Michuacan, which, like the republics of Tlaxcallan, Huexocingo and Cholollan, was always independent of the Mexican empire, was Tzintzontzan, a town situated on the banks of a lake, infinitely picturesque, called the lake of Patzquaro. Tzintzontzan, which the Aztec inhabitants of Tenochtitlan called Huitzitzila, is now only a poor Indian village, though it still preserves the pompous title of city (*ciudad*).

The intendancy of Valladolid, vulgarly called in the country Michuacan, is bounded on the north by the Rio de Lerma, which farther east takes the name of Rio Grande de Santiago. On the east and north-east it joins the intendancy of Mexico; on the north the intendancy of Guanaxuato; and on the west that of Guadalaxara.

STATISTICAL ANALYSIS. } IV. *Intendancy of Valladolid.*

The greatest length of the province of Valladolid from the port of Zacatula to the basaltic mountains of Palangeo, in a direction from S.S.E. to N.N.E. is 78 leagues. It is washed by the South Sea for an extent of coast of more than 38 leagues.

Situated on the western declivity of the cordillera of Anahuac, intersected with hills and charming vallies, which exhibit to the eye of the traveller a very uncommon appearance under the torrid zone, that of extensive and well watered meadows, the province of Valladolid in general enjoys a mild and temperate climate, exceedingly conducive to the health of the inhabitants. It is only when we descend the table-land of Ario and approach the coast that we find a climate in which the new colonists, and frequently even the indigenous, are subject to the scourge of intermittent and putrid fevers.

The most elevated summit of the intendancy of Valladolid is the Pic de *Tancitaro*, to the east of Tuspan. I never could see it near enough to take an exact measurement of it; but there is no doubt that it is higher than the Volcan de Colima, and that it is more frequently covered with snow. To the east of the Pic de Tancitaro the *Volcan de Jorullo* Xorullo, or Juruyo) was formed in the night of the 29th September, 1759, of which we

have already spoken*. M. Bonpland and myself reached its crater on the 19th September, 1803. The great catastrophe in which this mountain rose from the earth, and by which a considerable extent of ground totally changed its appearance, is, perhaps, one of the most extraordinary physical revolutions in the annals of the history of our planet†. Geology points out the parts of the ocean, where, at recent epoquas within the last two thousand years, near the Azores, in the Egean sea, and to the south of Iceland, small volcanic islands have risen above the surface of the water; but it gives us no ex-

* Chap. iii. and *Geographie des Plantes*, page 130. The heights now indicated by me are founded on the barometrical formula of M. Laplace. They are the result of the latest operation of M. Oltmanns; and sometimes differ 20 or 30 metres whom what is assigned in the *Geographie des Plantes*, composed shortly after my return to Europe, when it was impossible to give to such a great number of calculations all the precision of which they are susceptible. (See Note written in the month of Nivôse, year 13, at the end of the Geography of Plants, p. 147.)

† Strabo relates (*ed. Alm.* tom. i. p. 102.) that in the plains in the neighbourhood of Methone, on the banks of the Gulph of Hermione, a volcanic explosion produced a mountain of scoria (a *monte novo*), to which he attributes the enormous height of seven stadia; which, on the supposition of the Olympic stadia (*Voyage de Nearque, par M. Vincent.* p. 56.) would be 1249 metres! (4096 feet English.)' However exaggerated this assertion may be, the geological fact undoubtedly merits the attention of travellers.

STATISTICAL ANALYSIS. } IV. *Intendancy of Valladolid.*

ample of the formation, from the centre of a thousand small burning cones, of a mountain of scoria and ashes 517 metres * in height, comparing it only with the level of the old adjoining plains in the interior of a continent 36 leagues distant from the coast, and more than 42 leagues from every other active volcano. This remarkable phenomenon was sung in hexameter verses by the Jesuit Father Raphael Landivar, a native of Guatimala. It is mentioned by the Abbe Clavigero in the ancient history of his country †; and yet it has remained unknown to the mineralogists and naturalists of Europe, though it took place not more than fifty years ago, and within six days' journey of the capital of Mexico, descending from the central table land towards the shores of the South Sea.

A vast plain extends from the hills of Aguasarco to near the villages of Teipa and Petatlan, both equally celebrated for their fine plantations of cotton. This plain, between the *Picachos del Mortero*, the *Cerros de las Cuevas, y de Cuiche*, is only from 750 to 800 metres ‡ above the level of the sea. In the middle of a tract of ground in

* 1695 feet. *Trans.*

† *Storia antica di Messico*, vol. i. p. 42. and *Rusticatio Mexicana*, (the poem of Father Landivar, of which the 2nd edition appeared at Bologna in 1782,) p. 17.

‡ From 2400 to 2624 feet. *Trans.*

which porphyry with a base of grünstein predominates, basaltic cones appear, the summits of which are crowned with ever-green oaks of a laurel and olive foliage, intermingled with small palm trees with flabelliform leaves. This beautiful vegetation forms a singular contrast with the aridity of the plain, which was laid waste by volcanic fire.

Till the middle of the 18th century, fields cultivated with sugar-cane and indigo occupied the extent of ground between the two brooks called Cuitamba and San Pedro. They were bounded by basaltic mountains, of which the structure seems to indicate that all this country at a very remote period had been already several times convulsed by volcanoes. These fields, watered by artificial means, belonged to the plantation *(hacienda)* of San Pedro de Jorullo, one of the greatest and richest of the country. In the month of June 1759, a subterraneous noise was heard. Hollow noises of a most alarming nature (*bramidos*), were accompanied by frequent earthquakes, which succeeded one another for from 50 to 60 days, to the great consternation of the inhabitants of the *hacienda*. From the beginning of September every thing seemed to announce the complete re-establishment of tranquillity, when in the night between the 28th and 29th, the horrible subterraneous noise recommenced. The affrighted In-

STATISTICAL ANALYSIS. } IV. *Intendancy of Valladolid.*

dians fled to the mountains of Aguasarco. A tract of ground from three to four square miles in extent*, which goes by the name of *Malpays*, rose up in the shape of a bladder. The bounds of this convulsion are still distinguishable in the fractured strata. The *Malpays* near its edges is only 12 metres† above the old level of the plain called the *playas de Jorullo;* but the convexity of the ground thus thrown up increases progressively towards the centre to an elevation of 160 metres‡.

Those who witnessed this great catastrophe from the top of Aguasarco assert that flames were seen to issue forth for an extent of more than half a square league, that fragments of burning rocks were thrown up to prodigious heights, and that through a thick cloud of ashes, illumined by the volcanic fire, the softened surface of the earth was seen to swell up like an agitated sea. The rivers of Cuitamba and San Pedro precipitated themselves into the burning chasms. The decomposition of the water contributed to invigorate the flames, which were distinguishable at the city of Pascuaro, though situated on a very extensive table land 1400 metres§ elevated above the plains of *las playas* de Jorullo. Eruptions of mud, and

* The French mile is, it is believed, nearly as 2.887 to 1, almost thrice the length of an English mile; but it is uncertain what mile the author uses here. *Trans.*

† 39 feet. *Trans.* ‡ 524 feet. *Trans.*

§ 4592 feet. *Trans.*

especially of strata of clay enveloping balls of decomposed basaltes in concentrical layers, appear to indicate that subterraneous water had no small share in producing this extraordinary revolution. Thousands of small cones, from two to three metres* in height called by the indigenes *ovens* (*hornitos*), issued forth from the *Malpays*. Although within the last fifteen years, according to the testimony of the Indians, the heat of these volcanic ovens has suffered a great diminution, I have seen the thermometer rise to 95°† on being plunged into fissures which exhale an aqueous vapour. Each small cone is a *fumarola*, from which a thick vapour ascends to the height of ten or fifteen metres. In many of them a subterraneous noise is heard, which appears to announce the proximity of a fluid in ebullition.

In the midst of the ovens six large masses elevated from 4 to 500 metres‡ each above the old level of the plains, sprung up from a chasm, of which the direction is from the N.N.E. to the S.S.E. This is the phenomenon of the Montenovo of Naples, several times repeated in a range of volcanic hills. The most elevated of these enormous masses, which bears some resemblance to the *puys* de l'Auvergne, is the great Volcan de

From 6.5 feet to 9.8. feet. *Trans.*

† 202° f Fahrenheit. *Trans.*

‡ From 312 to 1640 feet. *Trans.*

Jorullo. It is continually burning, and has thrown up from the north side an immense quantity of scorified and basaltic lavas containing fragments of primitive rocks. These great eruptions of the central volcano continued till the month of February 1760. In the following years they became gradually less frequent. The Indians, frightened at the horrible noises of the new volcano, abandoned at first all the villages situated within seven or eight leagues distance of the playas de Jorullo. They became gradually, however, accustomed to this terrific spectacle; and having returned to their cottages, they advanced towards the mountains of Aguasarco and Santa Iñes, to admire the streams of fire discharged from an infinity of great and small volcanic apertures. The roofs of the houses of Queretaro were then covered with ashes at a distance of more than 48 leagues in a straight line from the scene of the explosion. Although the subterraneous fire now appears far from violent*,

* We found in the bottom of the crater the air at 47°, and in some places at 58 and 60° (116°, 130° and 139° of Fahrenheit). We passed over crevices which exhaled a sulphureous vapour, in which the thermometer rose to 85° (185° Fahrenheit). The passage over these crevices and heaps of scoria, which cover considerable hollows, render the descent into the crater very dangerous. I shall reserve the detail of my geological researches relative to the volcano of Jorullo for the historical account of my travels. The atlas accompanying that account will contain three plates: 1. The picturesque view of the new volcano, which is three times higher than the Monte Novo of Puzzole,

STATISTICAL ANALYSIS. IV. *Intendancy of Valladolid.*

and the Malpays and the great volcano begin to be covered with vegetables, we nevertheless found the ambient air heated to such a degree by the action of the small ovens (*hornitos*, that the thermometer at a great distance from the surface and in the shade rose as high as 43° *. This fact appears to prove that there is no exaggeration in the accounts of several old Indians, who affirm that for many years after the first eruption the plains of Jorullo, even at a great distance from the scene of the explosion, were uninhabitable, from the excessive heat which prevailed in them.

The traveller is still shown, near the Cerro de Santa Iñes, the rivers of Cuitamba and San Pedro, of which the limpid waters formerly watered the sugar-cane plantation of Don André Pimentel. These streams disappeared in the night of the 29th September, 1759; but at a distance of 2000 metres† farther west, in the tract which was the theatre of the convulsion, two rivers are now seen bursting through the argilaceous vault of the

sprung up in 1538, almost on the very shore of the Mediterranean; 2. the vertical section of the Malpays; 3. the geographical map of the plains of Jorullo, drawn up by means of the sextant, employing the method of perpendicular bases, and angles of altitude. The volcanic productions of this convulsed district are to be found in the cabinet of the School of Mines at Berlin. The plants collected in the environs are to be found in the herbals deposited by me in the Museum of Natural History at Paris.

* 109° of Fahrenheit. *Trans.* † 6561 feet. *Trans.*

hornitos, of the appearance of mineral waters, in which the thermometer rises to 52°,7 ‡. The Indians continue to give them the names of San Pedro and Cuitamba, because in several parts of the Malpays great masses of water are heard to run in a direction from east to west, from the mountains of Santa Inés towards *l'Hacienda de la Presentacion*. Near this habitation there is a brook, which disengages itself from the sulphureous hydrogen. It is more than 7 metres in breadth, and is the most abundant hydro-sulphureous spring which I have ever seen.

In the opinion of the Indians, these extraordinary transformations which we have been describing, the surface of the earth raised up and burst by the volcanic fire, and the mountains of scoria and ashes heaped together, are the work of the monks, the greatest, no doubt, which they have ever produced in the two hemispheres! In the cottage which we occupied in the *playas* de Jorullo, our Indian host related to us, that in 1759 Capuchin missionaries came to preach at the plantation of San Pedro, and not having met with a favourable reception (perhaps not having got so good a dinner as they expected), they poured out the most horrible and unheard of imprecations against the then beautiful and fertile plain, and prophesied, that in the first place the plantation would be

‡ 126°,8 of Fahrenheit. *Trans.*

swallowed up by flames rising out of the earth, and that afterwards the ambient air would cool to such a degree that the neighbouring mountains would for ever remain covered with snow and ice. The former of these maledictions having already produced such fatal effects, the lower Indians contemplate in the increasing coolness of the volcano the sinister presage of a perpetual winter. I have thought proper to relate this vulgar tradition, worthy of figuring in the epic poem of the Jesuit Landivar, because it forms a striking feature in the picture of the manners and prejudices of these remote countries. It proves the active industry of a class of men who too frequently abuse the credulity of the people, and pretend to suspend by their influence the immutable laws of nature for the sake of founding their empire on the fear of physical evils*.

* The monks seem to have acted with no small share of sagacity under all the circumstances in which they were placed. It is true, no doubt, as M. de Humboldt observes, that they indulged pretty freely in miracles; but it is to this that we are chiefly, perhaps, to ascribe the introduction of the religion of benevolence and humanity among them. This religion is not in their hands every thing that we could wish; still, however, in its worst modification it must partake something of the divine spirit of its author.

Miracles would seem to be necessary to the foundation and dissemination of every religion, however convincing its evidence, especially among barbarous and half civilized nations. It is not by reasoning or logical subtlety that such a people,

STATISTICAL ANALYSIS. } IV. *Intendancy of Valladolid.*

The position of the new Volcan de Jorullo gives rise to a very curious geological observation. We

the great mass of whom have neither leisure nor aptitude for it, can be brought to shake themselves free of the religious impressions, of whatever nature, to which they have been accustomed from their infancy, and which are interwoven with every feeling and association of their nature. The change can only, in general, be effected by the operation of such means as are calculated to produce astonishment and terror in an uncultivated mind, which will then be disposed to resign itself blindly to the guidance of the apparently supernatural agent. However obvious this truth may be, and however much confirmed by all our experience hitherto, those persons whose business it is to carry on at present the dissemination of religion have laid aside, certainly very imprudently, the operation of miracles, a privilege of which it appears the Roman catholics continue to avail themselves with success, and to the want of which our own bad success ought in a great measure to be ascribed. What reasonings, for instance, could have convinced so effectually the Betoya nation that *the sun is not God but fire to light us*, as the miracle which, in confirmation of his assertion, Padre Gumilla wrought on the arm of the chief Tunucua, by means of a lens? When Tunucua saw his arm roasting and swelling up, he could resist the truth no longer, and with sorrowful voice loudly exclaimed, "Truly, truly, the sun is fire! *Es verdad! Es verdad! fuego es el Sol!*" The whole passage is well worth transcribing, as it serves powerfully to illustrate the sagacity of the missionaries fathers, and the observation of M. de Humboldt. "Viendo pues que passaban muchos meses sin acabar de creer, que *el Sol era fuego*, me vali de la mecanica de un Lente ò Cristal de bastantes grados, y junta toda la gente en la Plaza, cogì la mano del Capitan mas capaz, llamado *Tunucua*. Preguntèle *si el Sol era Dios*? Luego respondiò que sì. Entonces, en voz alta, que oyeron todos, dixe:

STATISTICAL ANALYSIS. } IV. *Intendancy of Valladolid.*

already remarked in the third chapter, that in New Spain there is a *parallel of great elevations*, or a narrow zone contained between the 18° 59′ and the 19° 12′ of latitude, in which all the summits of Anahuac which rise above the region of perpetual snow are situated. These summits are either volcanoes which still continue to burn, or mountains, which from their form as well as the nature of their rocks have in all probability formerly contained subterraneous fire. As we recede from the coast of the Atlantic we find in a direction from east to west the Pic d'Orizaba, the two volcanoes of la Puebla, the Nevado de Toluca, the Pic de Tancitaro, and the Volcan de Colima. These great elevations, in place of forming the crest of the Cordillera of Anahuac, and following its direction, which is from the south-east to the north-west, are, on the contrary, placed on a line perpendicular to the axis of the great chain of mountains. It is undoubtedly worthy of observation, that in 1759 the new volcano of Jorullo was formed in the prolongation of that line, on the same parallel with the ancient Mexican volcanoes!

Day diami obay rcfolajuy! Thcoda futuit ajaduca, may mafurra. Quando accabeieis de creerme? Ya os tengo dicho, que el Sol no es sino fuego y diciendo y haciendo, interpuse el lente entre el Sol, y el brazo del dicho capitan, y al punto el rayo Solar le quemò, y levantò ampolla considerable en el brazo: clamò luego el con voz amarga, diciendo: Es verdad, Es verdad, fuego es el Sol." Gumilla, vol. II. p. 11.

STATISTICAL ANALYSIS. } IV. *Intendancy of Valladolid.*

A single glance bestowed on my plan of the environs of Jorullo will prove that the six large masses rose out of the earth, in a line which runs through the plain from the Cerro de las Cuevas to the Picacho del Mortero; and it is thus also that the bocche nove of Vesuvius are ranged along the prolongation of a chasm. Do not these analogies entitle us to suppose that there exists in this part of Mexico, at a great depth in the interior of the earth, a chasm in a direction from east to west for a length of 137 leagues, along which the volcanic fire bursting through the interior crust of the porphyritical rocks, has made its appearance at different epoquas from the gulf of Mexico to the South Sea? Does this chasm extend to the small group of islands called by M. Collnet the archipelago of Revillagigedo, around which, in the same parallel with the Mexican volcanoes, pumice-stone has been seen floating? Those naturalists who make a distinction between the facts which are offered us by descriptive geology and theoretical reveries on the primitive state of our planet, will forgive us these general observations on the general map of New Spain. Moreover, from the lake of Cuiseo, which is impregnated with muriate of soda, and which exhales sulfuretted hydrogen as far as the city of Valladolid, for an extent of 40 square leagues, there are a great

quantity of hot wells, which generally contain only muriatic acid, without any vestiges of terreous sulfates or metallic salts. Such are the mineral waters of Chucandiro, Cuinche, San Sebastian, and San Juan Tararamco.

The extent of the intendancy of Valladolid is one-fifth less than that of Ireland, but its relative population is twice greater than that of Finland. In this province there are 3 ciudades (Valladolid, Tzintzontzan, and Pascuaro); 3 *villas* (Citaquaro, Zamora, and Charo); 263 villages; 205 parishes; and 326 farms. The imperfect enumeration of 1793 gave a total population of 289,314 souls, of whom 40,399 were male whites, and 39,081 female whites; 61,352 male Indians, and 58,016 female Indians; and 154 monks, 138 nuns, and 293 individuals of the secular clergy.

The Indians who inhabit the province of Valladolid form three races of different origin, the Tarascs, celebrated in the sixteenth century for the gentleness of their manners, for their industry in the mechanical arts, and for the harmony of their language, abounding in vowels; the Otomites, a tribe yet very far behind in civilization, who speak a language full of nasal and guttural aspirations; and the Chichimecs, who, like the Tlascaltecs, the Nahuatlacs, and the Aztecs, have preserved the Mexican language. All the south part of the in-

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tendancy of Valladolid is inhabited by Indians. In the villages the only white figure to be met with is the *curé*, and he also is frequently an Indian or Mulatto. The benefices are so poor there that the bishop of Mechoacan has the greatest difficulty in procuring ecclesiastics to settle in a country where Spanish is almost never spoken, and where along the coast of the Great Ocean the priests infected by the contagious miasmata of malignant fevers frequently die before the expiration of seven or eight months.

The population of the intendancy of Valladolid decreased in the years of scarcity of 1786 and 1790; and it would have suffered still more if the respectable bishop of whom we spoke in the sixth chapter had not made extraordinary sacrifices for the relief of the Indians. He voluntarily lost in a few months the sum of 230,000 francs* by purchasing 50,000 fanegas of maize, which he sold at a reduced price to keep the sordid avarice of several rich proprietors within bounds, who, during that epoqua of public calamities, endeavoured to take advantage of the misery of the people.

* 9584*l.* sterling. *Trans.*

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The most remarkable places of the province of Valladolid are the following :

Population.

Valladolid de Mechoacan, the capital of the intendancy, and seat of a bishop, which enjoys a delicious climate. Its elevation above the level of the sea is 1950 metres* ; and yet at this moderate height, and under the 19° 42′ of latitude, snow has been seen to fall in the streets of Valladolid. This sudden change of atmosphere †, caused, no doubt, by a north wind, is much more remarkable than the snow which fell in the streets of Mexico the night before the Jesuit fathers were carried off! The new aqueduct by which the town receives potable water was constructed at the expense of the last bishop, Fray Antonio de San Miguel, and cost him nearly half a million of francs‡. 18,000

Pascuaro, on the banks of the picturesque lake of the same name, opposite to the Indian village of Janicho, situated

* 6396 feet. *Trans.*

† See my *Geographie des Plantes*, p. 133.

‡ 20,835*l*. *Trans.*

Population.

at something less than a league's distance, on a charming little island in the midst of the lake. Pascuaro contains the ashes of a very remarkable man, whose memory, after a lapse of two centuries and a half, is still venerated by the Indians, the famous Vasco de Quiroga, first bishop of Mechoacan, who died in 1556 at the village of Uruapa. This zealous prelate, whom the indigenous still call their father *(Tata don Vasco)*, was more successful in his endeavours to protect the unfortunate inhabitants of Mexico than the virtuous bishop of Chiapa, Bartholomé de las Casas. Quiroga became in an especial manner the benefactor of the Tarasc Indians, whose industry he encouraged. He prescribed one particular branch of commerce to each Indian village. These useful institutions are in a great measure preserved to this day. The height of Pascuaro is 2200 metres*. 6000

Tzintzontzan, or Huitzitzilla, the old capital of the kingdom of Mechoacan, of which we have already spoken. 2500

* 7217 feet. *Trans.*

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The intendancy of Valladolid contains the mines of Zitaquaro, Angangueo, Tlapuxahua, the Real del Oro, and Ynguaran.

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
V. Intendancy of Guadalaxara.	630,500	9,612	66

THIS province, part of the kingdom of Nueva Galicia, is almost twice the extent of Portugal, with a population five times smaller. It is bounded on the north by the intendancies of Sonora and Durango, on the east by the intendancies of Zacatecas and Guanaxuato, on the south by the province of Valladolid, and on the west, for a length of coast of 123 leagues, by the Pacific Ocean. Its greatest breadth is 100 leagues, from the port of San Blas to the town of Lagos, and its greatest length is from south to north from the Volcan de Colima to San Andres Teul 118 leagues.

The intendancy of Guadalaxara is crossed from east to west by the Rio de Santiago, a considerable river which communicates with the lake of Chapala, and which one day (when civilization shall have augmented in these countries) will become interesting for interior navigation from Salamanca and Zelaya to the port of San Blas.

All the eastern part of this province is the table-land and western declivity of the Cordilleras of Anahuac. The maritime regions, especially those

which stretch towards the great bay of Bayonne, are covered with forests, and abound in superb wood for ship building. But the inhabitants are exposed to an unhealthy and excessively heated air. The interior of the country enjoys a temperate climate, favourable to health.

The Volcan de Colima, of which the position has never yet been determined by astronomical observations, is the most western of the volcanos of New Spain, which are placed on the same line in the direction of one parallel. It frequently throws up ashes and smoke. An enlightened ecclesiastic, who long before my arrival at Mexico had made several very exact barometrical measurements, *Don Manuel Abad*, great vicar of the bishopric of Mechoacan, estimated the elevation of the Volcan de Colima above the level of the sea at 2800 metres*. "This insulated mountain," observes M. Abad, "appears only of a moderate height when its summit is compared with the ground of Zapotilti and Zapotlan, two villages of 2000 varas † of elevation above the level of the coast. It is from the small town of Colima that the volcano appears in all its grandeur. It is never covered with snow, but when it falls in the chain of the neighbouring mountains from the effects of

* 9185 feet. *Trans.* † 5505 feet. *Trans.*

STATISTICAL ANALYSIS. } V. *Intendancy of Guadalaxara.*

the north wind. On the 8th December, 1788, the volcano was covered with snow for almost two-thirds of its height*; but this snow only remained for two months on the northern declivity of the mountain towards Zapotlan. In the beginning of 1791 I made the tour of the volcano by Sayula, Tuspan, and Colima, without seeing the smallest trace of snow on its summits."

According to a manuscript memoir communicated to the tribunal of the Consulado of Vera Cruz by the intendant of Guadalaxara, the value of the agricultural produce of this intendancy amounted, in 1802, to 2,599,000 piastres† (nearly 13 millions of francs), in which there were computed 1,657,000 fanegas of maize, 43,000 cargas of wheat, 17,000 *tercios* of cotton (at 5 piastres the tercio), and 20,000 pounds of cochineal of Autlan (at 3 francs the pound). The value of the manufacturing industry was estimated at 3,302,200 piastres‡, or 16 millions and a half of francs.

* Let us suppose that the snow only covered the volcano for the half of its height. Now snow sometimes falls in the western part of New Spain under the latitude of 18° and 20°, at 1600 metres of elevation (5248 feet). These meteorological considerations would induce us to assign nearly 3200 metres (10,498 feet) for the height of the Volcan de Colima.

† = 13,644,750 francs = 568,531*l.* sterling. *Trans.*

‡ = 17,336,550 francs = 722,351*l.* sterling. *Trans.*

STATISTICAL ANALYSIS. } V. *Intendancy of Guadalaxara.*

The province of Guadalaxara contains 2 ciudades, 6 villas, and 322 villages. The most celebrated mines are those of Bolaños, Asientos de Ibarra, Hostiotipaquillo, Copala, and Guichichila near Tepic.

The most remarkable towns are:

Guadalaxara, on the left bank of the Rio de Santiago, the residence of the intendant, of the bishop, and the high court of justice (Audiencia).——Population 19,500

San Blas, a port, the residence of the *Departimiento de Marina* at the mouth of the Rio de Santiago. The official people (*officiales reales*) remain at Tepic, a small town, of which the climate is not so hot and is more salubrious. Within these ten years the question has been discussed if it would be useful to transfer the dock-yards, magazines, and the whole marine department from San Blas to Acapulco. This last port wants wood for ship-building. The air there is also equally unhealthy as at San Blas, but the projected change, by favouring the concentration of the naval force, would give the government a greater facility in knowing the wants of the marine and the means of supplying them.

Compostella, to the south of Tepic. To the north-west of Compostella, as well as in the par-

STATISTICAL ANALYSIS. V. *Intendancy of Guadalaxara.*

tidos of Autlan, Ahuxcatlan, and Acaponeta, a tobacco of a superior quality was formerly cultivated.

Aguas Calientes, a small well-peopled town to the south of the mines de los Asientos de Ibarra.

Villa de la Purificacion, to the north-west of the port of Guatlan, formerly called Santiago de Buena Esperanza, celebrated from the voyage of discovery, made in 532, by Diego Hurtado de Mendoza.

Lagos, to the north of the town of Leon, on a plain fertile in wheat on the frontiers of the intendancy of Guanaxuato.

Colima, two leagues south from the Volcan de Colima.

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
VI. Intendancy of Zacatecas.	153,300	2,355	65

THIS singularly ill peopled province is a mountainous and arid tract, exposed to a continual inclemency of climate. It is bounded on the north by the intendancy of Durango, on the east by the intendancy of San Luis Potosi, on the south by the province of Guanaxuato, and on the west by that of Guadalaxara. Its greatest length is 85 leagues, and its greatest breadth form Sombrerete to the Real de Ramos, 51 leagues.

The intendancy of Zacatecas is nearly of the same extent with Switzerland, which it resembles in many geological points of view. The relative population is hardly equal to that of Sweden.

The table-land, which forms the centre of the intendancy of Zacatecas, and which rises to more than 2000 metres* in height, is formed of Sienites, a rock on which repose, according to the excellent observations of *M. Valencia* †, strata of primitive

* 6561 feet. *Trans.*

† *Don Vicente Valencia*, pupil of M. del Rio and of the school of mines of Mexico, has written a very interesting description of the mines of Zacatecas (Gazeta de Mexico, tom. XI. p. 417).

STATISTICAL ANALYSIS. } VI. *Intendancy of Zacatecas.*

schistus and schistous chlorites (*chlorith-schiefer*). The schistus forms the base of the mountains of *grauwacke* and trappish porphyry. North of the town of Zacatecas are nine small lakes abounding in muriate, and especially carbonate of soda*. This carbonate, which, from the old Mexican word *tequixquilit*, goes by the name of tequesquite, is of great use in the dissolving of the muriates, and of the sulphurets of silver. *M. Garces*, an advocate of Zacatecas, has recently fixed the attention of his countrymen on the tequesquite, which is also to be found at Zacualco, between Valladolid and Guadalaxara, in the valley of San Francisco, near San Luis Potosi, at Acusquilco, near the mines of Bolaños, at Chorro near Durango, and in five lakes around the town of Chihuahua. The central table-land of Asia is not more rich in soda than Mexico.

The most remarkable places of this province are:

Zacatecas, at present, after Guanaxuato, the most celebrated mining place of New Spain. Its population is at least 33,000

* *Don Joseph Garces y Eguia, del beneficio de los metales de oro y plata Mexico*, 1802, p. 11 and 49 (a work which displays a very profound acquaintance with chemistry).

STATISTICAL ANALYSIS. } VI. *Intendancy of Zacatecas.*

Fresnillo, on the road from Zacatecas to Durango.

Sombrerete, the head town, and residence of a *Diputacion de Mineria*.

Besides the three places above named, the intendancy of Zacatecas contains also interesting metalliferous seams near the Sierra de Pinos, Chalchiguitec, San Miguel del Mezquitas, and Mazapil. It was this province, also, which in the mine of the *Veta Negra de Sombrerete* exhibited an example of the greatest wealth of any seam yet discovered in the two hemispheres.

STATISTICAL ANALYSIS.	Population. in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
VII. Intendancy of Oaxaca.	534,800	4,447	120

THE name of this province, which other geographers less correctly call *Guaxaca*, is derived from a Mexican name of the city and valley of *Huaxyacac*, one of the principal places of the Zapoteç country, which was almost as considerable as Teotzapotlan their capital. The intendancy of Oaxaca is one of the most delightful countries in this part of the globe. The beauty and salubrity of the climate, the fertility of the soil, and the richness and variety of its productions, all minister to the prosperity of the inhabitants; and this province has accordingly from the remotest periods been the centre of an advanced civilization.

It is bounded on the north by the intendancy of Vera Cruz, on the east by the kingdom of Guatimala, on the west by the province of Puebla, and on the south for a length of coast of 11 leagues by the Great Ocean. Its extent exceeds that of Bohemia and Moravia together; and its absolute population is nine times less; consequently its relative population is equal to that of European Russia.

STATISTICAL ANALYSIS. } VII. *Intendancy of Oaxaca.*

The mountainous soil of the intendancy of Oaxaca forms a singular contrast with that of the provinces of Puebla, Mexico, and Valladolid. In place of the strata of basaltes, amygdaloid, and porphyry with grünstein base, which cover the ground of Anahuac from the 18° to the 22° of latitude, we find only granite and gneiss in the mountains of Mixteca and Zapoteca. The chain of mountains of trapp formation only recommences to the south-east on the western coast of the kingdom of Guatimala. We know the height of none of these granitical summits of the intendancy of Oaxaca. The inhabitants of this fine country consider the Cerro de Senpualtepec, near Vilalta, from which both seas are visible, as one of the most elevated of these summits. However, this extent of horizon would only indicate a height of 2350 metres*. It is said that the same spectacle may be enjoyed at *la Ginetta*, on the limits of the bishoprics of Oaxacan and Chiapa, at 12 leagues

* The visual horizon of a mountain of 2350 metres (7709 feet) of elevation has a diameter of 3° 20′. The question has been discussed if the two seas could be visible from the summit of the Nevado de Toluca. The visual horizon of this has 2° 21′ or 58 leagues of radius, supposing only an ordinary refraction. The two coasts of Mexico nearest to the Nevado, those of Coyuca and Tuspan, are at a distance of 54 and 64 leagues from it.

STATISTICAL ANALYSIS. } VII. *Intendancy of Oaxaca.*

distance from the port of Tehuantepec, on the great road from Guatimala to Mexico.

The vegetation is beautiful and vigorous throughout the whole province of Oaxaca, and especially half way down the declivity in the temperate region, in which the rains are very copious from the month of May to the month of October. At the village of Santa Maria del Tule, three leagues east from the capital, between Santa Lucia and Tlacochiguaya, there is an enormous trunc of cupressus disticha (sabino) of 36 metres* in circumference. This ancient tree is consequently larger than the cypress of Atlixco, of which we have already spoken, the *dragonnier* of the Canary Islands, and all the boababs (Adansoniæ) of Africa. But on examining it narrowly, M. Anza observes that what excites the admiration of travellers is not a single individual, and that three united truncs form the famous sabino of Santa Maria del Tule.

The intendancy of Oaxaca comprehends two mountainous countries, which from the remotest times went under the names of *Mixteca* and *Tzapoteca*. These denominations, which remain to this day, indicate a great diversity of origin among the natives. The old Mixtecapan is now divided into upper and lower Mixteca (*Mixteca alta y*

* 118 feet. *Trans.*

baxa). The eastern limit of the former, which adjoins the intendancy of Puebla, runs in a direction from Ticomabacca, by Quaxiniquilapa, towards the South Sea. It passes between Colotopeque and Tamasulapa. The Indians of Mixteca are an active, intelligent, and industrious people.

If the province of Oaxaca contains no monuments of ancient Aztec architecture equally astonishing from their dimensions as the houses of the gods (*teocallis*) of Cholula, Papantla, and Teotihuacan, it contains the ruins of edifices more remarkable for their symmetry and the elegance of their ornaments. The walls of the palace of *Mitla* are decorated with *Grecques*, and labyrinths in mosaic of small porphyry stones. We perceive in them the same design which we admire in the vases falsely called Tuscan, or in the frise of the old temple of *Deus Redicolus*, near the grotto of the nymph Egeria at Rome. I caused part of these American ruins to be engraved, which were very carefully drawn by Colonel Don Pedro de la Laguna, and by an able architect, Don Luis Martin. If we are justly struck with the great analogy between the ornaments of the palace of Mitla and those employed by the Greeks and Romans, we are not on that account to give ourselves lightly up to historical hyphotheses, on the possibility of the existence of ancient communications between the

STATISTICAL ANALYSIS. } VII. *Intendancy of Oaxaca.*

two continents. We must not forget, that under almost every zone (as I have elsewhere endeavoured to demonstrate) mankind take a pleasure in a rhythmical repetition of the same forms which constitute the principal character of all that we call *Grecques**, meanders, labyrinths, and arabesques.

The village of Mitla was formerly called Miguitlan, a word which means in the Mexican language a place of sadness. The Tzapotec Indians call it *Leoba*, which signifies Tomb. In fact the palace of Mitla, the antiquity of which is unknown, was, according to the tradition of the natives, as is also manifest from the distribution of its parts, a palace constructed over the tombs of the kings. It was an edifice to which the sovereign retired for some time on the death of a son, a wife, or a mother. Comparing the magnitude of these tombs with the smallness of the houses which served for abodes to the living, we feel inclined to say with Diodorus Siculus (lib. i. c. 51.) that there are nations who erect sumptuous monuments for the dead, because, looking on this life as short and

* M. Zoega, the most profound connoisseur in Egyptian antiquities, has made the curious observation that the Egyptians have never employed this species of ornament.

passing, they think it unworthy the trouble of constructing them for the living.

The palace, or rather the tombs of Mitla, form three edifices symmetrically placed in an extremely romantic situation. The principal edifice is in best preservation, and is nearly 40 metres* in length. A stair formed in a pit leads to a subterraneous apartment of 27 metres in length and 8† in breadth. This gloomy apartment is covered with the same *Grecques* which ornament the exterior walls of the edifice.

But what distinguishes the ruins of Mitla from all the other remains of Mexican architecture, is six porphyry columns which are placed in the midst of a vast hall and support the cieling. These columns, almost the only ones found in the new continent, bear strong marks of the infancy of the art. They have neither base nor capitals. A simple contraction of the upper part is only to be remarked. Their total height is five metres‡; but their shaft is of one piece of amphibolous porphyry. Broken down fragments, for ages heaped together, conceal more than a third of the height of these columns. On uncovering them M. Martin found

* 131 feet. *Trans.*

† 88 feet by 26. *Trans.*

‡ 16.4 feet. *Trans.*

their height equal to six diameters, or 12 modules. Hence the symmetry would be still lighter than that of the Tuscan order, if the inferior diameter of the columns of Mitla were not in the proportion of 3 : 2 to their upper diameter.

The distribution of the apartments in the interior of this singular edifice bears a striking analogy to what has been remarked in the monuments of Upper Egypt, drawn by M. Denon and the *savans*, who compose the institute of Cairo. M. de Laguna found in the ruins of Mitla curious paintings representing warlike trophies and sacrifices. I shall have occasion elsewhere (in the historical account of my travels) to return to these remains of ancient civilization.

The intendancy of Oaxaca has alone preserved the cultivation of cochineal (coccus cacti), a branch of industry which it formerly shared with the provinces of Puebla and New Galicia.

The family of Hernan Cortez bears the title of Marquis of the Valley of Oaxaca. The property is composed of the four *villas del Marquesado* and 49 villages, which contain 17,700 inhabitants.

The most remarkable places of this province are:

Oaxaca, or *Guaxaca*, the ancient Huaxyacac, called *Antequera* at the be-

STATISTICAL ANALYSIS. } VII. *Intendancy of Oaxaca.*

Population.

ginning of the conquest. Thiery de Menonville only assigns 6000 inhabitants to it; but by the enumeration in 1792 it was found to contain 24,000.

Tehuantepec or *Teguantepeque*, a port situated in the bottom of the creek, formed by the ocean between the small villages of San Francisco, San Dionisio, and Santa Maria de la Mar. This port, impeded by a very dangerous bar, will become one day of great consequence when navigation in general, and especially the transport of the indigo of Guatimala, shall become more frequent by the Rio Guasacualco.

San Antonio de los Cues, a very populous place on the road from Orizaba to Oaxaca, celebrated for the remains of ancient Mexican fortifications.

The mines of this intendancy worked with the greatest care are, Villalta, Zolaga, Yxtepexi, and Totomostla.

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
VIII. Intendancy of Merida.	465,800	5,977	81

THIS intendancy, concerning which valuable information has been furnished to us by M. Gilbert*, comprehends the great peninsula of Yucatan, situated between the bays of Campeche and Honduras. It is at Cape Catoche, fifty-one leagues distant from the calcareous hills of Cape Saint Antony, that Mexico appears before the irruption of the ocean to have been joined to the island of Cuba.

The province of Merida is bounded on the south by the kingdom of Guatimala, on the east

* This enlightened observer went over a great part of the Spanish colonies. He had the misfortune to lose in a shipwreck south from the island of Cuba, among the shallows of the *Jardins du Roi*, of which I determined the astronomical position, the statistical materials collected by him. It is proper to observe here, that without knowing the data of which I was in possession, Mr. Gilbert, by estimating himself the number of villages and their population, concluded that Yucatan contained, in 1801, nearly half a million of inhabitants of all casts and colours.

STATISTICAL ANALYSIS. VIII. *Intendancy of Merida.*

by the intendancy of Vera Cruz, from which it is separated by the Rio Baraderas, called also the river of Crocodiles (*Lagartos*); on the west by the English establishments which extend from the mouth of the Rio Hondo to the north of the bay of Hanover, opposite the island of Ubero (Ambergris key). In this quarter Salamanca, or the small fort of *San Felipe de Bacalar*, is the most southern point inhabited by the Spaniards.

The peninsula of Yucatan, of which the northern coast from Cape Catoche, near the island of Contoy, to the Punta de Piedras (a length of 81 leagues), follows exactly the direction of the *current of rotation*, is a vast plain intersected in its interior from north-west to south-west by a chain of hills of small elevation. The country which extends east from these hills towards the bays of the Ascension and Santo Spirito appears to be the most fertile, and was earliest inhabited. The ruins of European edifices discoverable in the island Cosumel, in the midst of a grove of palm trees, indicate that this island, which is now uninhabited, was at the commencement of the conquest peopled by Spanish colonists. Since the settlement of the English between Omo and Rio Hondo, the government, to diminish the contraband trade, concentrated the Spanish and Indian population in the part of the peninsula west from

STATISTICAL ANALYSIS. } VIII. *Intendancy of Merida.*

the mountains of Yucatan. Colonists are not permitted to settle on the western coast*, on the banks of the Rio Bacalar and Rio Hondo. All this vast country remains uninhabited, with the exception of the military post (*presidio*) of Salamanca.

The intendancy of Merida is one of the warmest and yet one of the healthiest of equinoxial America. This salubrity ought undoubtedly to be attributed in Yucatan as well as at Coro, Cumana, and the island of Marguerite, to the extreme dryness of the soil and atmosphere. On the whole coast from Campeche, or from the mouth of the Rio de San Francisco to Cape Catoche, the navigator does not find a single spring of fresh water. Near this cape nature has repeated the same phenomenon which appears in the island of Cuba in the bay of Xagua, described by me in another place†. On the northern coast of Yucatan, at the mouth of the Rio Lagartos, 400 metres from the shore ‡, springs of fresh water spout up from amidst the salt water. These remarkable springs are called the mouths (*boccas*) *de Conil.* It is probable, that from some strong hydrostatical pression,

* Evidently *eastern coast. Trans.*

† In my *Tableaux de la Nature,* vol. II. p. 174 and 235.

‡ 1312 feet. *Trans.*

the fresh water, after burſting through the banks of calcarious rock between the clefts of which it had flowed, rises above the level of the salt water.

The Indians of this intendancy speak the Maya language, which is extremely guttural, and of which there are four tolerably complete dictionaries by Pedro Beltan, Andres de Avendaño, Fray Antonio de Ciudad-Real, and Luis de Villalpando. The peninsula of Yucatan was never subject to the Mexican or Aztec kings. However, the first conquerors Bernal Diaz, Hernandez de Cordova, and the valorous Juan de Grixalva, were struck with the advanced civilization of the inhabitants of this peninsula. They found houses built of stone cemented with lime, pyramidal edifices (teocallis) which they compared to Moorish mosques, fields enclosed with hedges, and the people clothed, civilized, and very different from the natives of the island of Cuba*. Many ruins, particularly of sepulchral monuments *(guacas)*, are still to be discovered to the east of the small central chain of mountains. Several Indian tribes have preserved their independence in the southern part of this

* Bernal Diaz adjudged the palm of superior civilization to the natives of Yucatan, because he found "*sus verguenças cubiertas.*" *Tuvimos los*, says he, *por hombres mas de razon que a los Indios de Cuba.* Why? *porque andavan los de Cuba con sus verguenças de fuera!* Hist. Verd. folio 2. col. 3. *Trans.*

STATISTICAL ANALYSIS. } VIII. *Intendancy of Merida.*

hilly district, which is almost inaccessible from thick forests and the luxuriance of the vegetation.

The province of Merida, like all the countries of the torrid zone, of which the surface does not rise more than 1300 metres* above the level of the sea, yields only for the sustenance of the inhabitants maize, jatropha, and dioscorea roots, but no European grain. The trees which furnish the famous Campeche wood (*hæmatoxylon campechianum L.*) grow in abundance in several districts of this intendancy. The cutting (*cortes de palo Campeche*) takes place annually on the banks of the Rio Champoton, the mouth of which is south from the town of Campeche, within four leagues of the small village of Lerma. It is only with an extraordinary permission from the intendant of Merida, who bears the title of *governor captain-general*, that the merchant can from time to time cut down Campeche wood to the east of the mountains near the bays of Ascension, Todos los Santos, and El Espirito Santo. In these creeks of the eastern coast the English carry on an extensive and lucrative contraband trade. The Campeche wood, after being cut down, must dry for a year before it can be sent to Vera Cruz, the Havanah, or Cadiz. The quintal of this dried wood (*palo*

* 4264 feet. *Trans.*

STATISTICAL ANALYSIS. } VIII. *Intendancy of Merida.*

de tinta) is sold at Campeche for two piastres, to two piastres and a half * (from 10 f. 50 c. to 12 f. 88 c.). The hæmotoxylon, so abundant in Yucatan and the Honduras coast, is also to be found scattered throughout all the forests of equinoxial America, wherever the mean temperature of the air is not below 22° † of the centigrade thermometer. The coast of Paria, in the province of New Andalusia, may one day carry on a considerable trade in Campeche and Brazil *(cæsalpinia)* wood, which it produces in great abundance.

The most remarkable places of the intendancy of Merida are:

Population.

Merida de Yucatan, the capital, ten leagues in the interior of the country, in an arid plain. The small port of Merida is called *Sizal*, to the west of Chaboana, opposite a sand bank, nearly twelve leagues in length. 10,000

Campeche, on the Rio de San Francisco, with a port which is not very secure. Vessels are obliged to anchor a good way from the shore. In the Maya language, *cam* signifies serpent, and *peche* the little

* From 8*s.* 9*d.* to 10*s.* 11*d.* *Trans.*

† 71° of Fahrenheit. *Trans.*

Population.

insect (acarus), called by the Spaniards *garapata*, which penetrates the skin, and occasions a smart pain. Between Campeche and Merida are two very considerable Indian villages called Xampolan and Equetchecan. The exportation of wax of Yucatan is one of the most lucrative branches of trade. The habitual population of the town is 6,000

Valladolid, a small town, of which the environs produce abundance of cotton of an excellent quality. This cotton, however, brings a poor price, because it has the disadvantage of adhering very much to the grain. They cannot clean it (*despepitar*, or *desmotar*) in the country; and two-thirds of its value is absorbed in freight, on account of the weight of the grain.

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square league.
IX. Intendancy of Vera Cruz.	156,000	4,141	38

THIS province, situated under the burning sun of the tropics, extends along the Mexican gulf, from the Rio Baraderas (or *de los Lagartos*) to the great river of Panuco, which rises in the metalliferous mountains of San Luis Potosi. Hence this intendancy includes a very considerable part of the eastern coast of New Spain. Its length, from the bay of Terminos near the island of Carmen to the small port of Tampico, is 210 leagues, while its breadth is only in general from 25 to 28 leagues. It is bounded on the east by the peninsula of Merida; on the west by the intendancies of Oaxaca, Puebla, and Mexico; and on the north by the colony of New Santander.

A glance bestowed on the 5th and 6th plates accompanying this work will show the extraordinary conformation of this country, which was formerly comprehended under the denomination of *Cuetlachtlan*. There are few regions in the new continent where the traveller is more struck with the assemblage of the most opposite climates. All the western part of the intendancy of Vera-

STATISTICAL ANALYSIS. } IX. *Intendancy of Vera Cruz.*

Cruz forms the declivity of the Cordilleras of Anahuac. In the space of a day the inhabitants descend from the regions of eternal snow to the plains in the vicinity of the sea, where the most suffocating heat prevails. The admirable order with which different tribes of vegetables rise above one another by strata, as it were, is no where more perceptible than in ascending from the port of Vera Cruz to the table-land of Perote. We see there the physiognomy of the country, the aspect of the sky, the form of plants, the figures of animals, the manners of the inhabitants, and the kind of cultivation followed by them, assume a different appearance at every step of our progress.

As we ascend, nature appears gradually less animated, the beauty of the vegetable forms diminishes, the shoots become less succulent, and the flowers less coloured. The aspect of the Mexican oak quiets the alarms of travellers newly landed at Vera Cruz. Its presence demonstrates to him that he has left behind him the zone so justly dreaded by the people of the north, under which the yellow fever exercises its ravages in New Spain. This inferior limit of oaks warns the colonist who inhabits the central table-land how far he may descend towards the coast, without dread of the mortal disease of the *vomito*. Forests of liquid-ambar, near Xalapa, announce by the freshness of

their verdure that this is the elevation at which the clouds suspended over the ocean come in contact with the basaltic summits of the Cordillera. A little higher, near la Banderilla, the nutritive fruit of the banana tree comes no longer to maturity. In this foggy and cold region, therefore, want spurs on the Indian to labour and excites his industry. At the height of San Miguel pines begin to mingle with the oaks, which are found by the traveller as high as the elevated plains of Perote, where he beholds the delightful aspect of fields sown with wheat. Eight hundred metres higher the coldness of the climate will no longer admit of the vegetation of oaks; and pines alone there cover the rocks, whose summits enter the zone of eternal snow. Thus in a few hours the naturalist in this miraculous country ascends the whole scale of vegetation from the heliconia and the banana plant, whose glossy leaves swell out into extraordinary dimensions, to the stunted parenchyma of the resinous trees!

The province of Vera Cruz is enriched by nature with the most precious productions. At the foot of the Cordillera, in the ever-green forests of Papantla, Nautla, and S. Andre Tuxtla, grows the epidendrum vanilla, of which the odoriferous fruit is employed for perfuming chocolate. The beautiful convolvulus jalapæ grows near the Indian

STATISTICAL ANALYSIS. } IX. *Intendancy of Vera Cruz.*

villages of Colipa and Misantla, of which the tuberose root furnishes the jalap, one of the most energetic and beneficent purgatives. The myrtle (*myrtus pimenta*), of which the grain forms an agreeable spice, well known in trade by the name of *pimienta de Tabasco*, is produced in the forests which extend towards the river of Baraderas, in the eastern part of the intendancy of Vera Cruz. The cocoa of Acayucan would be in request if the natives were to apply themselves more assiduously to the cultivation of cocoa trees. On the eastern and southern declivities of the Pic d'Orizaba, in the vallies which extend towards the small town of Cordoba, tobacco of an excellent quality is cultivated, which yields an annual revenue to the crown of more than 18 millions of francs*. The similax, of which the root is the true salsaparilla, grows in the humid and umbrageous ravins of the Cordillera. The cotton of the coast of Vera Cruz is celebrated for its fineness and whiteness. The sugar-cane yields nearly as much sugar as in the island of Cuba, and more than in the plantations of St. Domingo.

This intendancy alone would keep alive the commerce of the port of Vera Cruz, if the number of colonists was greater, and if their laziness, the

* 750,060*l.* sterling. *Trans.*

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effect of the bounty of nature, and the facility of providing without effort for the most urgent wants of life, did not impede the progress of industry. The old population of Mexico was concentrated in the interior of the country on the table-land. The Mexican tribes who came from northern countries, as we have already explained, gave the preference in their migrations to the ridges of the Cordilleras, because they found on them a climate analogous to that of their native country. No doubt, on the first arrival of the Spaniards on the coast of Chalchiuhcuecan (Vera Cruz), all the country from the river of Papaloapan (Alvarado to Huaxtecapan), was better inhabited and better cultivated than it now is. However, the conquerors found as they ascended the table-land the villages closer together, the fields divided into smaller portions, and the people more polished. The Spaniards, who imagined they founded new cities when they gave European names to Aztec cities, followed the traces of the indigenous civilization. They had very powerful motives for inhabiting the table-land of Anahuac. They dreaded the heat and the diseases which prevail in the plains. The search after the precious metals, the cultivation of European grain and fruit, the analogy of the climate with that of the Castilles, and the other causes indicated in the fourth chapter, all concurred to

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fix them on the ridge of the Cordillera. So long as the *Encomenderos*, abusing the rights which they derived from the laws, treated the Indians as serfs, a great number of them were transported from the regions of the coast to the table-land in the interior, either to work in the mines, or merely that they might be near the habitation of their masters. For two centuries the trade in indigo, sugar, and cotton, was next to nothing. The whites could by no means be induced to settle in the plains, where the true Indian climate prevails; and one would say that the Europeans came under the tropics merely to inhabit the temperate zone.

Since the great increase in the consumption of sugar, and since the new continent has come to furnish many of the productions formerly procured only in Asia and Africa, the plains *(tierras calientes)* afford, no doubt, a greater inducement to colonization. Hence, sugar and cotton plantations have been multiplying in the province of Vera Cruz, especially since the fatal events at St. Domingo, which have given a great stimulus to industry in the Spanish colonies. However, the progress hitherto has not been very remarkable on the Mexican coast. It will require centuries to re-people these deserts. Spaces of many square leagues are now only occupied by two or three huts *(hatos de ganado)*, around which stray herds

of half wild cattle. A small number of powerful families who live on the central table-land possess the greatest part of the shores of the intendancies of Vera Cruz and San Luis Potosi. No agrarian law forces these rich proprietors to sell their *mayorazgos*, if they persist in refusing to bring the immense territories which belong to them under cultivation. They harass their farmers, and turn them away at pleasure.

To this evil, which is common to the coast of the gulph of Mexico, with Andalusia and a great part of Spain, other causes of depopulation must be added. The militia of the intendancy of Vera Cruz is much too numerous for a country so thinly inhabited. This service oppresses the labourer. He flees from the coast to avoid being compelled to enter into the corps of the *lanceros* and the *milicianos*. The levies for sailors to the royal navy are also too frequently repeated, and executed in too arbitrary a manner. Hitherto the government has neglected every means for increasing the population of this desert coast. From this state of things results a great want of hands, and a scarcity of provisions, singular enough in a country of such great fertility. The wages of an ordinary workman at Vera Cruz are from 5 to 6 francs*

* From 4s. 2d. to 5s. *Trans.*

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per day. A master mason, and every man who follows a particular trade, gains from 15 to 20 francs per day, that is to say, three times as much as on the central table-land.

The intendancy of Vera Cruz contains within its limits two colossal summits, of which the one, the *Volcan d'Orizaba*, is, after the Popocatepetl, the most elevated mountain of New Spain. The summit of this truncated cone is inclined to the S.E. by which means the crater is visible at a great distance even from the city of Xalapa. The other summit, the *Coffre de Perote*, according to my measurement, is nearly 400 metres higher than the Pic of Teneriffe*. It serves for signal to the sailors who put in at Vera Cruz. As this circumstance renders the determination of its astronomical position of great importance, I observed circum-meridian altitudes of the sun on the *Coffre* itself. A thick bed of pumice-stone environs this porphyritical mountain. Nothing at the summit announces a crater; but the currents of lava observable between the small villages of las Vigas and Hoya appear to be the effects of a very old lateral explosion. The small *Volcan* de *Tuxtla*, joining the Sierra de San Martin, is situated four leagues from the coast, S.E. from the port of

* 1312 feet. *Trans.*

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Vera Cruz, near the Indian village of Santiago de Tuxtla. It is consequently out of the line which we before indicated as the parallel of the burning volcanoes of Mexico. Its last eruption, which was very considerable, took place on the 2d March, 1793. The roofs of the houses at Oaxaca, Vera Cruz, and Perote, were then covered with volcanic ashes. At Perote, which is 57 leagues* in a straight line distant from the volcano of Tuxtla, the subterraneous noises resembled heavy discharges of artillery.

In the northern part of the intendancy of Vera Cruz, west from the mouth of the Rio Tecolutla, at two leagues distance from the great Indian village of Papantla, we meet with a pyramidal edifice of great antiquity. The pyramid of Papantla remained unknown to the first conquerors. It is situated in the midst of a thick forest, called *Tajin* in the Totonac language. The Indians concealed this monument, the object of an ancient

* This distance is greater than that from Naples to Rome; and yet Vesuvius is not even heard beyond Gaeta. M. Bonpland and myself heard distinctly the noise of the Cotopaxi on its explosion in 1802, in the South Sea to the west of the island of Puna, 72 leagues distant from the crater. The same volcano was heard in 1744 at Honda and Mompox, on the banks of the river Madelena. See my *Geographie des Plantes*, page 53.

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veneration, for centuries from the Spaniards; and it was only discovered accidentally by some hunters about thirty years ago. This pyramid of Papantla was visited by M. Dupé *, an observer of great modesty and learning, who has long employed himself in curious researches regarding the idols and architecture of the Mexicans. He examined carefully the cut of the stones of which it is constructed; and he made a drawing of the hieroglyphics with which these enormous stones are covered. It is to be wished that he would publish the description of this interesting monument. The figure † published in 1788, in the Gazette of Mexico, is extremely imperfect.

The pyramid of Papantla is not constructed of bricks or clay mixed with whin stones, and faced with a wall of amygdaloid, like the pyramids of Cholula and Teotihuacan: the only materials employed are immense stones of a porphyritical shape. Mortar is distinguishable in the seams. The edifice, however, is not so remarkable for its size as for its symmetry, the polish of the stones,

* Captain in the service of the king of Spain. He possesses the bust in basaltes of a Mexican priestess, which I employed M. Massard to engrave, and which bears great resemblance to the *Calanthica* of the heads of Isis.

† See also *Monumenti di Architettura Messicana di Pietro Marquez*, Roma, 1804, tab. i.

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and the great regularity of their cut. The base of the pyramid is an exact square, each side being 25 metres* in length. The perpendicular height appears not to be more than from 16 to 20 metres †. This monument, like all the Mexican teocallis, is composed of several stages. Six are still distinguishable, and a seventh appears to be concealed by the vegetation with which the sides of the pyramid are covered. A great stair of 57 steps conducts to the truncated top of the teocalli, where the human victims were sacrificed. On each side of the great stair is a small stair. The facing of the stories is adorned with hieroglyphics, in which serpents and crocodiles carved in relievo are discernible. Each story contains a great number of square niches symmetrically distributed. In the first story we reckon 24 on each side, in the second 20, and in the third 16. The number of these niches in the body of the pyramid is 366, and there are 12 in the stair towards the east. The Abbé Marquez supposes that this number of 378 niches has some allusion to a calendar of the Mexicans; and he even believes that in each of them one of the twenty figures was repeated, which in the hieroglyphical language of the Toulecs served as a symbol for marking the days of

* 82 feet. *Trans.* † From 52 to 65 feet. *Trans.*

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the common year, and the intercalated days at the end of the cycles. The year being composed of 18 months, of which each had 20 days, there would then be 360 days, to which, agreeably to the Egyptian practice, five complementary days were added, called *nemontemi*. The intercalation took place every 52 years, by adding 13 days to the cycle, which gives $360 + 5 + 13 = 378$, simple signs, or composed of the days of the civil calendar, which was called *compohualilhuitl*, or *tonalpohualli*, to distinguish it from the *comilhuitlapohualliztli*, or ritual calendar used by the priests for indicating the return of sacrifices. I shall not attempt here to examine the hypothesis of the Abbe Marquez, which has a resemblance to the astronomical explanations given by a celebrated historian* of the number of apartments and steps found in the great Egyptian labyrinth.

The most remarkable cities of this province are:

Vera Cruz, the residence of the intendant, and the centre of European and West Indian commerce. The city is beautifully and regularly built, and inhabited by well-informed merchants, active and zealous for the good of their country.

* M. Gatterer.

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The interior police has been much improved during these few years. The district in which Vera Cruz is situated was formerly called Chalchiuhcuecan. The island on which the fortress of San Juan de Ulua was constructed at an enormous expense (according to vulgar tradition at an expense of 200 millions of francs*), was visited by Juan de Grixalva in 1518. He gave it the name of Ulua, because having found the remains of two unfortunate victims† there, and having asked the natives why they sacrificed men, they answered that it was by orders of the kings of *Acolhua* or Mexico. The Spaniards, who had Indians of Yucatan for interpreters, mistook the answer, and believed Ulua to be the name of the island. It is to similar mistakes that Peru, the coast of Paria, and several other provinces, owe their present names. The city of Vera Cruz is frequently called *Vera Cruz Nueva*, to distinguish it from Vera Cruz Vieja, situated near the mouth of the Rio Antigua, considered by all the historians as the first colony founded by Cortez. The falsity of this opinion has been proved by the Abbe Clavi-

* 8,334,000*l.* sterling. *Trans.*

† It appears that these sacrifices took place on several of the small islands around the port of Vera Cruz. One of these islands, the dread of navigators, still bears the name of *Isla de Sacrificios.*

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gero. The city begun in 1519, and called *Villarica*, or la Villa Rica de la Vera Cruz, was situated at three leagues distance from Cempoalla, the head town of the Totonacs, near the small port of Chiahuitzla, which we can with difficulty recognize in Robertson's work under the name of Quiabislan. Three years afterwards la Villa Rica was deserted, and the Spaniards founded another city to the south, which has preserved the name of *l'Antigua*. It is believed in the country that this second colony was again abandoned on account of the *vomito*, which at that period cut off more than two-thirds of the Europeans who landed in the hot season. The viceroy, Count de Monterey, who governed Mexico at the end of the sixteenth century, ordered the foundations of the Nueva Vera Cruz, or present city, to be laid opposite the island of San Juan d'Ulua in the district of Chalchiuhcuecan, in the very place where Cortez first landed on the 21st of April, 1519. This third city of Vera Cruz received its privileges of city only under Philip III. in 1615. It is situated in an arid plain, destitute of running water, on which the north winds, which blow with impetuosity from October till April, have formed hills of moving sand. These downs (*meganos de arena*) change their form and situation every year,

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They are from 8 to 12 metres * in height, and contribute very much by the reverberation of the sun's rays, and the high temperature which they acquire during the summer months, to increase the suffocating heat of the air of Vera Cruz. Between the city and the Aroyo Gavilan, in the midst of the downs, are marshy grounds covered with mangles and other brushwood. The stagnant water of the Baxio de la Tembladera, and the small lakes of l'Hormiga, el Rancho de la Hortaliza, and Arjona, occasions intermittent fevers among the natives. It is not improbable that it is also not one of the least important among the fatal causes of the *vomito prieto*, which we shall examine into in the sequel to this work. All the edifices of Vera Cruz are constructed of materials drawn from the bottom of the ocean, the stony habitation of the madrepores (*piedras de mucara*); for no rock is to be found in the environs of the city. The secondary formations, which repose on the porphyry of l'Encero, and which appear only near Acazonica, a farm of the Jesuits celebrated for its quarries of beautifully foliated gypsum, are covered with sand. Water is found on digging the sandy soil of Vera Cruz at the depth of a metre †; but this water proceeds from

* From 26 to 38 feet. *Trans.* † 9.8 feet. *Trans.*

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the filtration of the marshes formed in the downs. It is rain water, which has been in contact with the roots of vegetables; and is of a very bad quality, and only used for washing. The lower people and the fact is important for the medical topography of Vera Cruz) are obliged to have recourse to the water of a ditch (*zanja*) which comes from the *meganos*, and is somewhat better than the well water, or that of the brook of Tenoya. People in easy circumstances, however, drink rain water collected in cisterns, of which the construction is extremely improper, with the exception of the beautiful cisterns (*algibes*) of the castle of San Juan d'Ulua, of which the very pure and wholesome water is only distributed to those in the military. This want of good potable water has been for centuries looked upon as one of the numerous causes of the diseases of the inhabitants. In 1704 a project was formed for conducting part of the fine river of Xamapa to the port of Vera Cruz. King Philip V. sent a French engineer to examine the ground. The engineer, discontented, no doubt, with his stay in a country so hot and disagreeable to live in, declared the execution of the project impossible. In 1756 the debates were renewed among the engineers, the municipality, the governor, the viceroy's assessor, and the fiscal. Hitherto there has been spent in visits of

persons of skill and judicial expenses (for every thing becomes a law-suit in the Spanish colonies!) the sum of 2,250,000 francs*. Before surveying the ground, a dike or embankment has been formed 1100 metres† above the village of Xamapa, at an expense of a million and a half of francs‡, which is now nearly half destroyed. The government has levied for these twelve years on the inhabitants a duty on flour, which brings in annually more than 150,000 francs§. A stone aqueduct (*atarxea*) capable of furnishing a section of water of 116 square centimetres‖ is already constructed for a length of more than 900 metres¶; and yet, notwithstanding all these expenses, and the farago of memoirs and informes heaped up in the archives, the waters of the Rio Xamapa are still more than 23000** metres distant from the town of Vera Cruz. In 1795 they ended with what they ought to have begun with. A survey was made of the ground, and it was found that the mean body of the Xamapa was 8^{m}, 33†† (10 Mexican varas, and $22\frac{5}{7}$ inches) above the level of the streets of Vera Cruz. It was found that the great dike ought to have

* 93,757*l.* sterling. *Trans.*
† 3608 feet. *Trans.*
‡ 62,505*l* sterling. *Trans.*
§ 6250*l.* sterling. *Trans.*
‖ 17.98 square inches. *Trans.*
¶ 2,952 feet. *Trans.*
** 75459 feet. *Trans.*
†† 27,32 feet. *Trans.*

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been placed at Medellin, and that through ignorance it was constructed not only in a point of too great elevation, but also 7500 metres * farther from the port than the necessary fall for conveying the water demanded. In the present state of things, the construction of the aqueduct from the Rio Xamapa to Vera Cruz is estimated at five or six millions of francs †. In a country abounding with immense metallic wealth it is not the greatness of the sum which frightens the government. The project is put off because it has been lately calculated that ten public cisterns, placed without the precincts of the city, would not altogether cost more than 700,000 francs ‡, and would be sufficient for a population of 16,000 souls, if each cistern of water contained a volume of water of 670 cubic metres §. "Why?" it is said in the report to the viceroy, "why go so far to seek what nature affords at hand? Why not profit by the regular and abundant rains which, according to the accurate experiments of Colonel Costanzo, furnish three times more water than what falls in France and Germany?" The habitual population of Vera Cruz, without including the militia and seafaring people, is 16,000.

* 24605 feet. *Trans.* † 208,350*l.* or 250,020*l.* *Trans.*
‡ 29,169*l.* sterling. *Trans.* § 23,661 cubic feet. *Trans.*

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Xalapa (Xalapan), a town at the foot of the basaltic mountain of Maculteрec, in a very romantic situation. The convent of St. Francis, like all those founded by Cortez, resembles a fortress at a distance; for in the early periods of the conquest, convents and churches were constructed in such a manner as to serve for a defence in case of an insurrection of the natives. From this convent of St. Francis at Xalapa we enjoy a magnificent view of the colossal summits of the Cofre and the Pic d Orizaba, of the declivity of the cordillera (towards L'Encero, Otateo, and Apazapa), of the river of l'Antigua, and even of the ocean. The thick forests of styrax, piper, melastomata, and ferns resembling trees, especially those which are on the road from Pacha and San Andres, the banks of the small lake de los Berrios, and the heights leading to the village of Huastepec, offer the most delightful promenades. The sky of Xalapa, beautiful and serene in summer, from the month of December to the month of February wears a most melancholy aspect. Whenever the north wind blows at Vera Cruz the inhabitants of Xalapa are enveloped in a thick fog. The thermometer then descends to 12° or 16°*, and during this period (*estacion de los Nortes*) the sun

* 63° and 60° of Fahrenheit.

STATISTICAL ANALYSIS. } IX. *Intendancy of Vera Cruz.*

and stars are frequently invisible for two or three weeks together. The richest merchants of Vera Cruz have country houses at Xalapa, in which they enjoy a cool and agreeable retreat while the coast is almost uninhabitable from the mosquitos, the great heats, and the yellow fever. In this small town an establishment is to be found, the existence of which confirms what I have already advanced on the progress of intellectual cultivation in Mexico. This is an excellent school for drawing, founded within these few years, in which the children of poor artizans are instructed at the expense of people in better circumstances. The elevation of Xalapa above the level of the ocean is 1320 metres *. Its population is estimated at 13,000.

Perote (the ancient Pinahuizapan). The small fortress of San Carlos de Perote is situated to the north of the town of Perote. It is rather an armed station than a fortress. The surrounding plains are very barren, and covered with pumice-stone. There are no trees, with the exception of a few solitary trunks of cypress and molina. Height of Perote 2853 metres †.

Cordoba, a town on the eastern declivity of the Pic d'Orizaba, in a climate a good deal warmer than

* 4264 feet. *Trans.* † 7719 feet. *Trans.*

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that of Xalapa. The environs of Cordoba and Orizaba produce all the tobacco consumed in New Spain.

Orizaba, to the east of Cordoba, and a little to the north of the Rio Blanco, which discharges itself into the Laguna d'Alvarado. It has been long disputed if the new road from Mexico to Vera Cruz should go by Xalapa or Orizaba. Both these towns having a great interest in the direction of this road, have employed all the means of rivalry to gain over the constituted authorities to their respective sides. The result was, that the viceroys alternately embraced the cause of both parties, and during this state of uncertainty no road was constructed. Within these few years, however, a fine causeway was commenced from the fortress of Perote to Xalapa, and from Xalapa to L'Encero.

Tlacotlalpan, the principal place of the old province of Tabasco. Farther north are the small towns of Victoria and Villa Hermosa, the first of which is one of the oldest of New Spain.

The intendancy of Vera Cruz has no metallic mines of any importance. The mines of Zomelahuacan, near Jalacingo, are almost abandoned.

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	Number of Inhabitants to the square League.
X. Intendancy of San Luis Potosi.	334,900	27,821	12

THIS intendancy comprehends the whole of the north-east part of the kingdom of New Spain. As it borders either on desert countries, or countries inhabited by wandering and independent Indians, we may say that its northern limits are hardly determined. The mountainous tract called the *Bolson de Mapimi* includes more than 3000 square leagues, from which the Apachis sally out to attack the colonists of Cohahuila and New Biscay. Indented into these two provinces, and bounded on the north by the great Rio del Norte, the Bolson de Mapimi is sometimes considered as a country not conquered by the Spaniards, and sometimes as composing a part of the intendancy of Durango. I have traced the limits of Cohahuila and Texas, near the mouth of the Rio Puerco, and towards the sources of the Rio de San Saba, as I found them indicated in the special maps preserved in the archives of the viceroyalty, and drawn up by engineers in the Spanish service. But how is it possible to determine territorial limits in immense savannas, where the farms are from 15 to

STATISTICAL ANALYSIS. } X. *Intendancy of San Luis Potosi.*

20 leagues distant from one another, and where almost no trace of cultivation is any where to be found?

The intendancy of San Luis Potosi comprehends parts of a very heterogeneous nature, the different denominations of which have given great room for geographical errors. It is composed of provinces, of which some belong to the *Provincias internas*, and others to the kingdom of New Spain Proper. Of the former there are two immediately depending on the commandant of the *Provincias internas;* the two others are considered as *Provincias internas del Vireynato.* These complicated and unnatural divisions are explained in the following table:

The intendant of San Luis Potosi governs:

A. In Mexico Proper:

The *Province of San Luis*, which extends from the Rio de Panuco to the Rio de Santander, and which comprehends the important mines of Charcas, Potosi, Ramos, and Catorce.

B. In the *Provincias internas del Vireynato:*

1. The new kingdom of Leon.
2. The colony of New Santander.

C. In the *Provincias internas de la Commandancia general Oriental.*

1. The province of Cohahuila.
2. The province of Texas.

STATISTICAL ANALYSIS. } X. *Intendancy of San Luis Potosi.*

It follows from what we have already said on the latest changes which have taken place in the organization of the *Commandancia general* of Chihuahua, that the intendancy of San Luis now includes, besides the province of Potosi, all which goes under the denomination of *Provincias internas Orientales*. A single intendant is consequently at the head of an administration which includes a greater surface than all European Spain. But this immense country, gifted by nature with the most precious productions, and situated under a serene sky in the temperate zone, towards the borders of the tropic, is, for the greatest part, a wild desert, still more thinly peopled than the governments of Asiatic Russia. Its position on the eastern limits of New Spain, the proximity of the United States, the frequency of communication with the colonists of Louisiana, and a great number of circumstances which I shall not endeavour here to develope, will probably soon favour the progress of civilization and prosperity in these vast and fertile regions.

The intendancy of San Luis comprehends more than 220 leagues of coast, an extent equal to that from Genoa to Reggio in Calabria. But all this coast is without commerce and without activity, with the exception of a few small vessels,

which come from the West Indies to lay in provisions either at the Bar of Tampico, near Panuco, or at the anchorage of New Santander. That part which extends from the mouth of the great Rio del Norte to the Rio Sabina is almost still unknown, and has never been examined by navigators. It would be of great importance, however, to discover a good port in this northern extremity of the gulph of Mexico. Unfortunately, the eastern coast of New Spain offers every where the same obstacles, a want of depth for vessels drawing more than 38 decimetres * of water, bars at the mouths of the rivers, necks of land, and long islots, of which the direction is parallel to that of the continent, and which prevent all access to the interior basin. The shore of the provinces of Santander and Texas, from the 21° to the 29° of latitude, is singularly festooned, and

* 12 feet $5\frac{6}{10}$ inches. In page 82 of Vol. I. the author observes, "that the east of New Spain from the 18° to the 26° of latitude abounds with bars; and vessels which draw more than 32 centimetres ($12\frac{1}{2}$ inches) cannot pass over any of these bars without danger of grounding." In a former part of this volume, near the close of the statistical description of the intendancy of Mexico, he states that the bar of Tampico prevents the entry of vessels drawing more than from 45 to 60 decimetres (from 14 feet 9 inches to 19 feet 8 inches). See a former note, Vol. II. p. 180) *Trans.*

STATISTICAL ANALYSIS. } X. *Intendancy of San Luis Potosi.*

presents a succession of interior basins, from four to five leagues in breadth, and 40 to 50 in length. They go by the name of *lagunas*, or salt-water lakes. Some of them (the Laguna de Tamiagua, for example) are completely shut in. Others, as the Laguna Madre, and the Laguna de San Bernardo, communicate by several channels with the ocean. The latter are of great advantage for a coasting trade, as coasting vessels are there secure from the great swells of the ocean. It would be interesting for geology to examine on the spot if these lagunas have been formed by currents penetrating far into the country by irruptions, or if these long and narrow islets, ranged parallel to the coast, are bars which have gradually risen above the mean level of the waters.

Of the whole intendancy of San Luis Potosi, only that part which adjoins the province of Zacatecas, in which are the rich mines of Charcas, Guadalcazar, and Catorce, is a cold and mountainous country. The bishopric of Monterey, which bears the pompous title of New Kingdom of Leon, Cohahuila, Santander, and Texas, are very low regions; and there is very little undulation of surface in them. This soil is covered with secondary and alluvial formations. They possess an unequal climate, extremely hot in summer, and equally cold in winter, when the north winds drive

before them columns of cold air from Canada wards the torrid zone.

Since the cession of Louisiana to the United States, the bounds between the province of Texas and the county of Natchitoches (a county which is an integral part of the confederation of American republics), have become the subject of a political discussion, equally tedious and unprofitable. Several members of the Congress of Washington were of opinion that the territory of Louisiana might be extended to the left bank of the Rio bravo del Norte. According to them, "all the country called by the Mexicans the province of Texas anciently belonged to Louisiana. Now the United States ought to possess this last province in the whole extent of rights in which it was possessed by France before its cession to Spain; and neither the new denominations introduced by the viceroys of Mexico, nor the progress of population from Texas towards the east, can derogate from the lawful titles of the congress." During these debates the American government did not fail frequently to adduce the establishment that M. de Lasale, a Frenchman, formed about the year 1685 near the bay of St. Bernard, without having appeared to encroach on the rights of the crown of Spain.

But on examining carefully the general map

STATISTICAL ANALYSIS. } X. *Intendancy of San Luis Potosi.*

which I have given of Mexico and the adjacent countries on the east, we shall see that there is still a great way from the bay of St. Bernard to the mouth of the Rio del Norte. Hence the Mexicans very justly allege in their favour, that the Spanish population of Texas is of a very old date, and that it was brought, in the early periods of the conquest, by Linares, Revilla and Camargo, from the interior of New Spain; and that M. de Lasale, on disembarking to the west of the Mississipi, found Spaniards at that time among the savages whom he endeavoured to combat. At present, the intendant of San Luis Potosi considers the Rio Mermentas, or Mexicana, which flows into the Gulph of Mexico to the east of the Rio de Sabina, as the eastern limit of the province of Texas, and consequently of his whole intendancy.

It may be useful to observe here, that this dispute as to the true boundaries of New Spain can only become of importance when the country, brought into cultivation by the colonists of Louisania, shall come in contact with the territory inhabited by Mexican colonists; when a village of the province of Texas shall be constructed near a village of the county of the Opeloussas. Fort Clayborne, situated near the old Spanish mission of the Adayes (Adaes or Adaisses, on the Red River, is the settlement of Louisiana which ap-

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proaches nearest to the military posts (*presidios*) of the province of Texas; and yet there are nearly 68 leagues from the presidio of Nacogdoch to Fort Clayborne. Vast steppes, covered with gramina, serve for common boundaries between the American confederation and the Mexican territory. All the country to the west of the Mississippi, from the Ox River to the Rio Colorado of Texas, is uninhabited. These steppes, partly marshy, present obstacles very easily overcome. We may consider them as an arm of the sea which separates adjoining coasts, but which the industry of new colonists will soon penetrate. In the United States the population of the Atlantic provinces flowed first towards the Ohio and the Tennessee, and then towards Louisiana. A part of this fluctuating population will soon move farther to the westward. The very name of Mexican territory will suggest the idea of proximity of mines; and on the banks of the Rio Mermentas the American colonist will already in imagination possess a soil abounding in metallic wealth. This error, diffused among the lower people, will give rise to new emigrations; and they will only learn very late that the famous mines of Catorce, which are the nearest to Louisiana, are still more than 300 leagues distant from it.

Several of my Mexican friends have gone the

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road from New Orleans to the capital of New Spain. This road, opened by the inhabitants of Louisiana, who come to purchase horses in the provincias internas, is more than 540 leagues in length, and is consequently equal to the distance from Madrid to Warsaw. This road is said to be very difficult from the want of water and habitations; but it presents by no means the same natural difficulties as must be overcome in the tracks along the ridge of the Cordilleras from Santa Fe in New Grenada to Quito, or from Quito to Cusco. It was by this road of Texas that an intrepid traveller, M. Pagés, captain in the French navy, went in 1767 from Louisiana to Acapulco. The details which he furnishes relative to the intendancy of San Luis Potosi, and the road from Queretaro to Acapulco, which I travelled thirty years afterwards, display great precision of mind and love of truth; but, unfortunately, this traveller is so incorrect in the orthography of Mexican and Spanish names, that we can with difficulty find out from his descriptions the places through which he passed *. The road from Louisiana to Mexico presents very few obstacles until the Rio del Norte,

* M. Pagés calls *Loredo*, la Rheda; the fort de *la Bahia del Esperitu Santo*, Labadia; *Orquo quissas*, Acoquissa; *Saltillo*, le Sartille; *Cohahuila*, Cuwilla.

STATISTICAL ANALYSIS. X. *Intendancy of San Luis Potosi,*

and we only begin from the Saltillo to ascend towards the table land of Anahuac. The declivity of the Cordillera is by no means rapid there; and we can have no doubt, considering the progress of civilization in the new continent, that land communication will become gradually very frequent between between the United States and New Spain. Public coaches will one day roll on from Philadelphia and Washington to Mexico and Acapulco.

The three counties of the state of Louisiana, or New Orleans, which approach nearest to the desert country considered as the eastern limit of the province of Texas, are, reckoning from south to north, the counties of the Attacappas, of the Opeloussas, and of the Natchitoches. The latest settlements of Louisiana are on a meridian which is twenty-five leagues east from the mouth of the Rio Mermentas. The most northern town is Fort Clayborne of Nachitoches, seven leagues east from the old situation of the mission of the Adayes. To the north-east of Clayborne is the *Spanish Lake*, in the midst of which there is a great rock covered with stalactites. Following this lake to the south-south-east, we meet in the extremities of this fine country, brought into cultivation by colonists of French origin, first, with the small village of St. Landry, three leagues to the north of the sources of the Rio Mermentas; then the

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plantation of S. Martin; and, lastly, New Iberia, on the river Teche, near the canal of Bontet, which leads to the lake of Tase. As there is no Mexican settlement beyond the eastern bank of the Rio Sabina, it follows that the uninhabited country which separates the villages of Louisiana from the missions of Texas amounts to more than 1500 square leagues. The most southern part of these savannas, between the bay of Carcusin and the bay of la Sabina, presents nothing but impassable marshes. The road from Louisiana to Mexico goes therefore farther to the north, and follows the parallel of the 32d degree. From Natchez travellers strike to the north of the lake Cataouillou, by Fort Clayborne of Natchitoches; and from thence they pass by the old situation of the Aadayes to Chichi, and the fountain of Father Gama. An able engineer, M. Lafond, whose map throws much light on these countries, observes, that eight leagues north from the post of Chichi there are hills abounding in coal, from which a subterraneous noise is heard at a distance like the discharge of artillery. Does this curious phenomenon announce a disengagement of hydrogen produced by a bed of coal in a state of inflammation? From the Adayes the road of Mexico goes by San Antonio de Bejar, Loredo (on the banks of the Rio grande del Norte), Saltillo,

Charcas, San Luis Potosi, and Queretaro, to the capital of New Spain. Two months and a half are required to travel over this vast extent of country, in which, from the left bank of the Rio grande del Norte to Natchitoches we continually sleep *sub dio.*

The most remarkable places of the intendancy of San Luis are:

San Luis Potosi, the residence of the intendant, situated on the eastern declivity of the table-land of Anahuac, to the west of the sources of the Rio de Panuco. The habitual population of this town is 12,000.

Nuevo Santander, capital of the province of the same name, does not admit the entry of vessels drawing more than from eight to ten *palmas** of water. The village of *Sotto la Marina*, to the east of Santander, might become of great consequence to the trade of this coast could the port be remedied. At present the province of Santander is so desert, that fertile districts of ten or twelve square leagues were sold there in 1802 for ten or twelve francs.

Charcas, or Santa Maria de las Charcas, a very

* From 5⅓ to 6.878 feet. *Trans.*

STATISTICAL ANALYSIS. } X. *Intendancy of San Luis Potosi.*

considerable small town, the seat of a diputacion de Minas.

Catorce, or la Purissima Concepcion de Alamos de Catorce, one of the richest mines of New Spain. The *Real* de Catorce, however, has only been in existence since 1773, when Don Sebastian Coronado and Don Bernabe Antonio de Zepeda discovered these celebrated seams, which yield annually the value of more than from 18 to 20 millions of francs *.

Monterey, the seat of a bishop, in the small kingdom of Leon.

Linares, in the same kingdom, between the Rio Tigre and the great Rio Bravo del Norte.

Monclova, a military post *(presidio)*, capital of the province of Cohahuila, and residence of a governor.

San Antonio de Bejar, capital of the province of Texas, between the Rio de los Nogales and the Rio de San Antonio.

* From 730,460*l.* to 833,500*l.* sterling. *Trans.*

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
XI. Intendancy of Durango.	159,700	16,873	

THIS intendancy, better known under the name of New Biscay, belongs, as well as Sonora and Nuevo Mexico (which remain to be described), to the *Provincias internas Occidentales*. It occupies a greater extent of ground than the three united kingdoms of Great Britain; and yet its total population scarcely exceeds that of the two towns of Birmingham and Manchester united. Its length from south to north, from the celebrated mines of Guarisamey to the mountains of Carcay, situated to the north-west of the Presidio de Yanos, is 232 leagues. Its breadth is very unequal, and near Parral is scarcely 58 leagues.

The province of Durango, or Nueva Biscaya, is bounded on the south by la Nueva Galicia, that is to say, by the two intendancies of Zacatecas and Guadalaxara; on the south-east by a small part of the intendancy of San Luis Potosi; and on the west by the intendancy of Sonora. But towards the north, and especially the east, for more than 200 leagues, it is bounded by an uncultivated country, inhabited by warlike and independent

STATISTICAL ANALYSIS. } XI. *Intendancy of Durango.*

Indians. The Acoclames, the Cocoyames, and the Apaches Mescaleros and Fardones possess the Bolson de Mapimi, the mountains of Chanate and the Organos on the left bank of the Rio Grande del Norte. The Apaches Mimbreños are farther to the west, in the wild ravines of the Sierra de Acha. The Cumanches and the numerous tribes of Chichimecs, comprehended by the Spaniards under the vague name of Mecos, disturb the inhabitants of New Biscay, and force them to travel always well armed or in great bodies. The military posts (*presidios*) with which the vast frontiers of the *provincias internas* are provided, are too distant from one another to prevent the incursions of these savages, who, like the Bedouins of the desert, are well acquainted with all the stratagems of petty warfare. The Cumanches Indians, mortal enemies of the Apaches, of whom several hordes live at peace with the Spanish colonists, are the most formidable to the inhabitants of New Biscay and New Mexico. Like the Patagonians of the Straits of Magellan, they have learned to tame the horses which run wild in these regions since the arrival of the Europeans. I have been assured by well-informed travellers, that more agile and smart horsemen do not exist than the Cumanches Indians, and that for centuries they have been scouring these plains, which are intersected by mountains that enable them to lie in ambuscade to

surprise passengers. The Cumanches, like almost all the savages wandering among savannas, are ignorant of their primitive country. They have tents of buffalo hides, with which they do not load their horses, but great dogs, which accompany the wandering tribe. This circumstance, already taken notice of in the manuscript journal of the journey of Bishop Tamaron *, is very remarkable, and brings to mind analogous habits among the tribes of northern Asia. The Cumanches are so much the more to be dreaded by the Spaniards, as they kill all the adult prisoners, and merely preserve children, whom they carefully bring up to make slaves of.

The number of warlike and savage Indians (*Indios bravos*) who infest the frontiers of New Biscay has been somewhat on the decline since the end of the last century, and they make fewer attempts to penetrate into the interior of the inhabited country for the sake of pillaging and destroying the Spanish villages. However, their hatred to the whites is constantly the same, and the consequence of a war of extermination entered upon from a barbarous policy, and continued with more courage than success. The Indians are concentrated towards

* *Diario de la visita diocesana del Illustrissimo Senor Tamaron, obispo de Durango hecha en* 1759 *y* 1760. (M.S.)

STATISTICAL ANALYSIS. } XI. *Intendancy of Durango.*

the north in the Moqui, and the mountains of Nabajoa, where they have reconquered a considerable territory from the inhabitants of New Mexico. This state of things has produced the most fatal consequences, which will be felt for centuries, and which are every way deserving of examination. These wars, if they have not destroyed, have at least removed all hopes of bringing round these savage hordes to social life by gentle means. The spirit of vengeance and an inveterate hatred have raised an almost insurmountable barrier between the Indians and whites. Many tribes of Apaches, Moquis, and Yutas, who go by the denomination of Indians of Peace (*Indios de Paz*), are attached to the soil, live in huts collected together, and cultivate maize. They would have less objections, perhaps, to unite with the Spanish colonists, if they found Mexican Indians among them. The analogy of manners and habits, and the resemblance which exists, not in the sounds, but in the mechanism and general structure of the American languages, may become powerful bonds of union among people of the same origin. A wise legislation might be able, perhaps, to efface the recollection of those barbarous times, when a corporal or serjeant in the *Provincias internas* went out to hunt down the Indians like so many wild

STATISTICAL ANALYSIS. } XI. *Intendancy of Durango.*

beasts. It is probable that the copper-coloured individual would rather choose to live in a village inhabited by other individuals of his own race, than to mix with whites who would domineer over him with arrogance; but we have already seen in the sixth chapter that, unfortunately, there are almost no Indian peasantry of the Aztec race in New Biscay and New Mexico. In the former of these provinces there is not a single tributary individual, and all the inhabitants are either white or consider themselves to be so. All assume the right of putting the title of *Don* before their baptismal names, even such as those who in the French islands, through an aristocratic refinement, by which languages are enriched, go by the appellation of *Petits blancs*, or *Messieurs passables*.

This struggle with the Indians, which has lasted for centuries, and the necessity in which the colonist, living in some lonely farm, or travelling through arid deserts, finds himself of perpetually watching after his own safety, and defending his flock, his home, his wife, and his children against the incursions of wandering Indians; and, in short, that state of nature which subsists in the midst of the appearance of an ancient civilization, have all concurred to give to the character of the inhabitants of the north of New Spain an energy

and temperament peculiar to themselves. To these causes we must no doubt add the nature of the climate, which is temperate, an eminently salubrious atmosphere, the necessity of labour in a soil by no means rich or fertile, and the total want of Indians and slaves who might be employed by the whites for the sake of giving themselves up securely to idleness and sloth. In the *Provincias internas* the developement of physical strength is favoured by a life of singular activity, which is for the most part passed on horseback. This way of life is essentially necessary from the care demanded by the numerous flocks of horned cattle which roam about almost wild in the savannas. To this strength of a healthy and robust body we must join great strength of mind, and a happy disposition of the intellectual faculties. Those who preside over seminaries of education in the city of Mexico have long observed that the young people who have most distinguished themselves for their rapid progress in the exact sciences, were for the most part natives of the most northern provinces of New Spain *.

* The connection between a sound mind and sound body, *mens sana in corpore sano*, has been often remarked; and those countries of which the climate and mode of life are most fa-

STATISTICAL ANALYSIS. } XI. *Intendancy of Durango.*

The intendancy of Durango comprehends the northern extremity of the great table-land of Ana-

vourable to the physical powers of man give to his mental powers, perhaps, an equal superiority. The people who breathe the keen air of Lebanon form a striking contrast to the half animated inhabitants of the plains of Syria. What a contrast also between the natives of Switzerland and those of the marshes of Holland. In Spain we see in like manner a keen and animated race in the mountains of Biscay and Catalonia; and in France it is not on the banks of the Seine, but in the mountains and vales of the Cevennes, of the inhabitants of which Marmontel draws so fine a picture in his Memoirs, where the national character appears to the greatest advantage. In Germany and Italy the natives of the hills and vales of Saxony and Tuscany equally outstrip the rest of their countrymen; and, perhaps, in our country it is not among the unhealthy occupation of the trading and manufacturing towns of the south where we are to seek for the most acute and intelligent population. Those who have examined attentively the different classes of inhabitants in this island have uniformly remarked, that the healthy inhabitants of the country are not more superior in bodily perfection than in mental qualities to the automaton inhabitants of our cities. The Greeks, of whom we know not from the remains which have come down to us whether most to admire the beauty of their form or their mental endowments, were studious of every art by which the physical energies could be developed, and were more ambitious, perhaps, of being the first men than the first weavers in the world. Mental energy must always more or less depend on a sound and vigorous temperament; and though the most perfect man may not be the savage of Rousseau, we are not the more, however, to look for him in the enervated inhabitant of the cotton-mill or the drawing-room. *Trans.*

STATISTICAL ANALYSIS. } XI. *Intendancy of Durango.*

huac, which declines to the north-east towards the banks of the Rio Grande del Norte. The environs of the city of Durango are still, however, according to the barometrical measurement of Don Juan Jose d'Oteyza, more than 2000 metres * elevated above the level of the ocean. This great elevation appears to continue till towards Chihuahua; for it is the central chain of the Sierra Madre, which (as we have already indicated in the general physical view of the country †) near San Jose del Parral runs in a direction north-north-west towards the Sierra Verde and the Sierra de las Grullas.

There are reckoned in la Nueva Biscaya one city or *ciudad* (Durango), six *villas* (Chihuahua, San Juan del Rio, Nombre de Dios, Papasquiaro, Saltillo, and Mapimi), 199 villages or *pueblos*, 75 parishes or *paroquias*, 152 farms or *haciendas*, 37 missions, and 400 cottages or *ranchos*.

The most remarkable places are:

Durango, or Guadiana, the residence of an intendant and a bishop, in the most southern part of New Biscay, at 170 leagues distance,

6561 feet. *Trans.* † Vol. I. p. 63.

STATISTICAL ANALYSIS. } XI. *Intendancy of Durango.*

in a straight line from the city of Mexico, and 298 from the town of Santa Fe. The height of the town is 2087 metres *. There are frequent falls of snow, and the thermometer (under the 24° 25') descends to 8° † below the freezing point. A groupe of rocks, covered with scoria, called *la Breña*, rise in the middle of a very level plain between the capital, the plantations del Ojo, and del Chorro, and the small town of Nombre de Dios. This groupe, of a very grotesque form, which is 12 leagues in length from north to south, and six leagues in breadth from east to west, deserves particularly to fix the attention of mineralogists. The rocks, which consitute the Breña, are of basaltic amygdaloid, and appear to have been raised up by volcanic fire. The neighbouring mountains were examined by M. Oteyza, particularly that of the Frayle, near the hacienda de l'Ojo. He found on the summit a crater of nearly 100 metres ‡ in circumference, and more than 30 § metres of perpendicular depth. In the environs of Durango is also to be found insulated in the plain the enormous mass of malleable iron and nickel, which is of the identical composition of the

* 6845 feet. *Trans.*

† 14° of Fahr. *Trans.*

‡ 328 feet. *Trans.*

§ 98 feet. *Trans.*

STATISTICAL ANALYSIS. } XI. *Intendancy of Durango.*

aerolithos, which fell in 1751 at Hraschina, near Agram in Hungary. Specimens were communicated to me by the learned director of the *Tribunal de Mineria de Mexico*, Don Fausto d'Elhuyar, which I deposited in different cabinets of Europe, and of which MM. Vauquelin and Klaproth published an analysis. This mass of Durango is affirmed to weigh upwards of 1900 myriagrammes *, which is 400 † more than the aerolithos discovered at Olumpa in the Tucuman by M. Rubin de Celis. A distinguished mineralogist, M. Frederick Sonnenschmidt ‡, who travelled over much more of Mexico than myself, discovered also in 1792, in the interior of the town of Zacatecas, a mass of malleable iron of the weight of 97 myriagrammes §, which in its exterior and physical character was found by him entirely analogous with the malleable iron described by the celebrated Pallas. The population of Durango is 12,000.

Chihuahua, the residence of the captain-general of the Provincias internas, surrounded with considerable mines to the east of the great real of Santa Rosa de Cosiguiriachi.—Population, 11,600.

* 41,933 pounds avoirdupois. *Trans.*

† 8228 pounds avoirdupois. *Trans.*

‡ *Gazeta de Mexico*, tom. v. p. 59.

§ 2140 pounds avoirdupois. *Trans.*

STATISTICAL ANALYSIS. } XI. *Intendancy of Durango.*

San Juan del Rio, to the south west of the lake of Parras. We must not confound this town with the place which bears the same name in the intendancy of Mexico, which is situated to the east of Queretaro.—Population, 10,200.

Nombre de Dios, a considerable town on the road from the famous mines of Sombrerete to Durango.—Population, 6,800.

Pasquiaro, a small town to the south of the Rio de Nasas —Population, 5,600.

Saltillo, on the confines of the province of Cohahuila and the small kingdom of Leon. This town is surrounded with arid plains, in which the traveller suffers very much from want of water. The table-land on which the Saltillo is situated descends towards Monclova, the Rio del Norte, and the province of Texas, where, in place of European corn, we find only fields covered with cactus.—Population, 6,000.

Mapimis, with a military post (*presidio*) to the east of the Cerro de la Cadena, on the uncultivated border, called Bolson de Mapimi.—Population, 2,400.

Parras, near a lake of the same name, west from Saltillo. A species of wild vine found in this beautiful situation has procured it the name of Parras from the Spaniards. The conquerors transplanted to this place the *vitis vinifera* of Asia; and this branch of industry has succeeded

STATISTICAL ANALYSIS. } XI. *Intendancy of Durango.*

very well, notwithstanding the hatred sworn by the monopolists of Cadiz for centuries to the cultivation of the olive, the vine, and the mulberry, in the provinces of Spanish America.

San Pedro de Batopilas, formerly celebrated for the great wealth of its mines, to the west of the Rio de Conchos.—Population, 8,000.

San Jose del Parral, the residence of a *Diputacion de Minas*. This *real*, as well as the town of Parras, received its name from the great number of wild vine shoots with which the country was covered on the first arrival of the Spaniards. —Population, 5,000.

Santa Rosa de Cosiguiriachi, surrounded with silver mines, at the foot of the Sierra de los Mêtates. I have seen a very recent memoir of the intendant of Durango, in which the population of this real was made to amount to 10,700.

Guarisamey, very old mines on the road from Durango to Copala.—Population, 3,800.

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
XII. Intendancy of Sonora.	121,400	19,143	6

THIS intendancy, which is still more thinly peopled than that of Durango, extends along the Gulph of California, called also the Sea of Cortez, for more than 280 leagues from the great bay of Bayona, or the Rio del Rosario, to the mouth of the Rio Colorado, formerly called Rio de Balzas, on the banks of which the missionary monks Pedro Nadal and Marcos de Niza made astronomical observations in the 16th century. The breadth of the intendancy is by no means uniform. From the tropic of Cancer to the 27th degree the breadth scarcely exceeds 50 leagues; but farther north, towards the Rio Gila, it increases so considerably, that on the parallel of Arispe it is more than 128 leagues.

The intendancy of Sonora comprehends an extent of hilly country of greater surface than the half of France; but its absolute population is not equal to the fourth of the most peopled department of that empire. The intendant who resides in the town of Arispe has the charge, as well as the intendant of San Luis Potosi, of the administration

STATISTICAL ANALYSIS. } XII. *Intendancy of Sonora.*

of several provinces, which have preserved the particular names which they had before the union. The intendancy of Sonora, consequently, comprehends the three provinces of *Cinaloa*, or Sinaloa, Ostimury and Sonora Proper. The first extends from the Rio del Rosario to the Rio del Fuerte; the second from the Rio del Fuerte to the Rio del Mayo; and the province of Sonora, called also in old maps by the name of New Navarre, includes all the northern extremity of this intendancy. The small district of Cinaloa is now looked on as part of the province of Cinaloa. The intendancy of Sonora is bounded on the west by the sea; on the south by the intendancy of Guadalaxara; and on the east by a very uncultivated part of New Biscay. Its northern limits are very uncertain. The villages de la Pimeria alta are separated from the banks of the Rio Gila by a region inhabited by independent Indians, of which neither the soldiers stationed in the presidios, nor the monks posted in the neighbouring missions, have been hitherto able to make the conquest*.

* To go *a la conquista*, to conquer *(conquistar)*, are the technical terms used by the missionaries in America to signify that they have planted crosses, around which the Indians have constructed a few huts; but, unfortunately for the Indians, the words *conquer* and *civilize* are by no means synonymous.

STATISTICAL ANALYSIS. } XII. *Intendancy of Sonóra.*

The three most considerable rivers of Sonora are Culiacan, Mayo, and Yaqui, or Sonora. From the port of Guitivis, at the mouth of the Rio Mayo, called also Santa Cruz de Mayo, the courier embarks for California, charged with the dispatches of the government and the public correspondence. This courier goes on horseback from Guatimala to the city of Mexico, and from thence by Guadalaxara and the Rosario to Guitivis. After crossing in a *lancha* the sea of Cortez, he disembarks at the village of Loreto in Old California. From this village letters are sent from mission to mission to Monterey and the port of San Francisco, situated in New California under 37° 48′ of north latitude. They thus traverse a route of posts of more than 920 leagues, that is to say, a distance equal to that from Lisbon to Cherson. The river of Yaqui, or Sonora, has a course of considerable length. It takes its rise in the western declivity of the *Sierra madre*, of which the crest, by no means very elevated, passes between Arispe and the Presidio de Fronteras. The small port of Guaymas is situated near its mouth.

The most northern part of the intendancy of Sonora bears the name of *Pimeria*, on account of a numerous tribe of Pimas Indians who inhabit it. These Indians, for the most part, live under the domination of the missionary monks, and follow

STATISTICAL ANALYSIS. } XII. *Intendancy of Sonora.*

the catholic ritual. The Pimeria *alta* is distinguished from the Pimeria *baxa*. The latter contains the Presidio de Buenavista. The former extends from the military post (*presidio*) of Fernate to the Rio Gila. This hilly country of the Pimeria alta is the Choco of North America. All the ravins and even plains contain gold scattered up and down the alluvious land. *Pepitas* of pure gold of the weight of from two to three kilogrammes* have been found there. But these *lavaderos* are by no means diligently sought after, on account of the frequent incursions of the independent Indians, and especially on account of the high price of provisions, which must be brought from a great distance in this uncultivated country. Farther north, on the right bank of the Rio de la Ascencion, live a very warlike race of Indians, the *Seris*, to whom several Mexican *savans* attribute an Asiatic origin, on account of the analogy between their name and that of the Seri, placed by ancient geographers at the foot of the mountains of Ottorocorras to the east of *Scythia extra Imaum*.

There has been hitherto no permanent communication between Sonora, New Mexico, and New

* From 5*lb.* 2*oz.* 2*dr.* 2*scr.* 8*gr.* } Troy. *Trans.*
To 8 0 4 0 12 }

STATISTICAL ANALYSIS. } XII. *Intendancy of Sonora.*

California, although the court of Madrid has frequently given orders for the formation of presidios and missions between the Rio Gila and the Rio Colorado. The extravagant military expedition of Don Joseph Galvez did not serve to establish in a permanent manner the northern limits of the intendancy of Sonora. Two courageous and enterprising monks, fathers Garces and Font, were able, however, to go by land through the countries inhabited by independent Indians from the missions of la Pimeria alta to Monterey, and even to the port of San Francisco, without crossing the peninsula of Old California. This bold enterprize, on which the college of the propaganda at Queretaro published an interesting notice, has also furnished new information relative to the ruins of *la Casa grande*, considered by the Mexican historians* as the abode of the Aztecs on their arrival at the Rio Gila towards the end of the twelfth century.

Father Francisco Garces, accompanied by Father Font†, who was entrusted with the observations

* *Clavigero*, i. p. 159.

† *Chronica Serafica de el Colegio de Propaganda fede de Queretaro, por Fray Domingo Arricivitor, Mexico*, 1792, *tom.* ii. p. 396, 426, and 462. This Chronica, which forms a large folio volume of 600 pages, is well deserving of an extract being made from it. It contains very accurate geographical notions

STATISTICAL ANALYSIS. } XII. *Intendancy of Sonora.*

of latitude, set out from the Presidio d'Horcasitas on the 20th April, 1773. After a journey of eleven days they arrived at a vast and beautiful plain one league's distance from the southern bank of the Rio Gila. They there discovered the ruins of an ancient Aztec city, in the midst of which is the edifice called *la Casa grande.* These ruins occupy a space of ground of more than a square league. The *Casa grande* is exactly laid down according to the four cardinal points, having from north to south 136 metres* in length, and from east to west 84 metres† in breadth. It is constructed of clay *(tapia).* The *pisés*‡ are of an unequal size, but symmetrically placed. The walls are 12 decimetres§ in thickness. We perceive that this edifice had three stories and a terrace. The stair was on the outside, and probably

as to the Indian tribes inhabiting California, Sonora, the Moqui, Nabajoa, and the banks of the Rio Gila." I could not learn what sort of astronomical instruments Father Font made use of in his excursions to the Rio Colorado between 1771 and 1776. I am afraid lest it should have been a solar ring.

* 445 feet. *Trans.* † 276 feet. *Trans.*

‡ *Pisé* has no equivalent, it is believed, in our language. It signifies the case in which the clay is rammed down in the construction of a clay wall. This mode of building has been adopted on the Duke of Bedford's estate. *Trans.*

§ 3 feet 11 inches. *Trans.*

of wood. The same kind of construction is still to be found in all the villages of the independent Indians of the Moqui west from New Mexico. We perceive in the Casa grande five apartments, of which each is $8^m,3$ in length, $3^m,3$ in breadth, and $3^m,5$ in height*. A wall, interrupted by large towers, surrounds the principal edifice, and appears to have served to defend it. Father Garces discovered the vestiges of an artificial canal, which brought the water of the Rio Gila to the town. The whole surrounding plain is covered with broken earthen pitchers and pots, prettily painted in white, red, and blue. We also find amidst these fragments of Mexican stone-ware pieces of obsidian (*itztli*); a very curious phenomenon, because it proves that the Aztecs passed through some unknown northern country which contains this volcanic substance, and that it was not the abundance of obsidian in New Spain which suggested the idea of razors and arms of itztli. We must not, however, confound the ruins of this city of the Gila, the centre of an ancient civilization of the Americans, with the *Casas grandes* of New Biscay, situated between the presidio of Yanos and that of San Buenaventura. The latter are

* 27.18 feet, 10.82 feet, and 11.48 feet. *Trans.*

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pointed out by the indigenous, on the very vague supposition that the Aztec nation in their migration from Aztlan to Tula and the valley of Tenochtitlan made three stations; the first near the lake Teguyo (to the south of the fabulous city of Quivira, the Mexican Dorado!) the second at the Rio Gila, and the third in the environs of Yanos.

The Indians who live in the plains adjoining the Casas grandes of the Rio Gila, and who have never had the smallest communication with the inhabitants of Sonora, deserve by no means the appellation of *Indios bravos*. Their social civilization forms a singular contrast with the state of the savages who wander along the banks of the Missoury and other parts of Canada. Fathers Garces and Font found the Indians to the south of the Rio Gila clothed and assembled together, to the number of two or three thousand, in villages which they call Uturicut and Sutaquisan, where they peaceably cultivate the soil. They saw fields sown with maize, cotton, and gourds. The missionaries, in order to bring about the conversion of these Indians, showed them a picture painted on a large piece of cotton cloth, in which a sinner was represented burning in the flames of hell. The picture terrified them; and they en-

treated Father Garces not to unroll it any more, nor speak to them of what would happen after death. These Indians are of a gentle and sincere character. Father Font explained to them by an interpreter the security which prevailed in the Christian missions, where an Indian alcalde administered justice. The chief of Uturicut replied: "This order of things may be necessary for you. We do not steal, and we very seldom disagree; what use have we then for an alcalde among us?" The civilization to be found among the Indians when we approach the north-west coast of America, from the 33° to the 54° of latitude, is a very striking phenomenon, which cannot but throw some light on the history of the first migrations of the Mexican nations.

There are reckoned in the province of Sonora one city (*ciudad*), Arispe; two towns (*villas*), viz. Sonora and Hostemuri; 46 villages (*pueblos*), 15 parishes (*paroquias*), 43 missions, 20 farms (*haciendas*), and 25 cottages (*ranchos*).

The province of Cinaloa contains five towns (Culiacan, Cinaloa, el Rosario, el Fuerte, and los Alamos), 92 villages, 30 parishes, 14 *haciendas*, and 450 *ranchos*.

In 1793 the number of tributary Indians in the province of Sonora amounted only to 251, while

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in the province of Cinaloa they amounted to 1851. This last province was more anciently peopled than the former.

The most remarkable places of the intendancy of Sonora are:

Arispe, the residence of the intendant, to the south and west of the presidios of Bacuachi and Bavispe. Persons who accompanied M. Galvez in his expedition to Sonora affirm, that the mission of Ures near Pitic would have answered much better than Arispe for the capital of the intendancy.—Population, 7,600.

Sonora, south from Arispe, and N E. from the presidio of Horcasitas.—Population, 6,400.

Hostimuri, a small town well peopled, surrounded with considerable mines.

Culiacan, celebrated in the Mexican history under the name of Hueicolhuacan. The population is estimated at 10,800.

Cinaloa, called also the *Villa de San Felipe y Santiago*, east from the port of *Santa Maria d'Aome*.—Population, 9,500.

El Rosario, near the rich mines of Copala.—Population, 5,600.

Villa del Fuerte, or Montesclaros, to the north of Cinaloa.—Population, 7,900.

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Los Alamos, between the Rio del Fuerte and the Rio Mayo, the residence of a *diputacion de Mineria*.—Population, 7,900.

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
XIII. Province of Nuevo Mexico.	40,200	5,709	7

SEVERAL geographers confound New Mexico with the *Provincias internas;* and they speak of it as a country rich in mines, and of vast extent. The celebrated author of the philosophic history of the European establishments in the two Indies has contributed to propagate this error. What he calls the empire of New Mexico is merely a coast inhabited by a few poor colonists. It is a fertile territory, but very thinly inhabited, and destitute, as is universally believed, of metallic wealth, extending along the Rio del Norte, from the 31° to the 38° of north latitude. This province is from south to north 175 leagues in length, and from east to west from 30 to 50 leagues in breadth; and its territorial extent, therefore, is much less than people of no great information in geographical matters are apt to suppose even in that country. The national vanity of the Spaniards loves to magnify the spaces, and to remove, if not in reality, at least in imagination, the limits of the country occupied by them to as great a distance as possible. In the memoirs which I

procured on the position of the Mexican mines, the distance from Arispe to the Rosario is estimated at 300, and from Arispe to Copala at 400 marine leagues, without reflecting that the whole intendancy of Sonora is not 280 marine leagues in length. From the same cause, and especially for the sake of conciliating the favour of the court, the *conquistadores*, the missionary monks, and the first colonists, gave weighty names to small things. We have already described one kingdom, that of Leon, of which the whole population does not equal the number of Franciscan monks in Spain. Sometimes a few collected huts take the pompous title of *villa*. A cross planted in the forests of Guyana figures on the maps of the missions sent to Madrid and Rome, as a village inhabited by Indians. It is only after living long in the Spanish colonies, and after examining more narrowly these fictions of kingdoms, towns, and villages, that the traveller can form a proper scale for the reduction of objects to their just value.

The Spanish conquerors shortly after the destruction of the Aztec empire set on foot solid establishments in the north of Anahuac. The town of Durango was founded under the administration of the second viceroy of New Spain, *Velasco el Primero*, in 1559. It was then a military post against the incursions of the Chichimec

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Indians. Towards the end of the 16th century, the viceroy, count de Monterey, sent the valorous *Juan de Onate* to New Mexico. It was this general who, after driving off the wandering Indians, peopled the banks of the great Rio del Norte.

From the town of Chihuahua a carriage can go to Santa Fe of New Mexico. A sort of caleche is generally used, which the Catalonians call *volantes*. The road is beautiful and level; and it passes along the eastern bank of the great river (*Rio grande*), which is crossed at the Passo del Norte. The banks of the river are extremely picturesque, and are adorned with beautiful poplars, and other trees peculiar to the temperate zone.

It is remarkable enough to see that, after the lapse of two centuries of colonization, the province of New Mexico does not yet join the intendancy of New Biscay. The two provinces are separated by a desert, in which travellers are sometimes attacked by the Cumanches Indians. This desert extends from the Passo del Norte towards the town of Albuquerque. Before 1680, in which year there was a general revolt among the Indians of New Mexico, this extent of uncultivated and uninhabited country was much less considerable than it is now. There were then three villages, San Pascual, Semillete, and Socorro,

which were situated between the marsh of the Muerto and the town of Santa Fe. Bishop Tamaron perceived the ruins of them in 1760; and he found apricots growing wild in the fields, an indication of the former cultivation of the country. The two most dangerous points for travellers are the defile of Robledo, west from the Rio del Norte, opposite the Sierra de Dona Ana, and the desert of the Muerto, where many whites have been assassinated by wandering Indians.

The desert of the Muerto is a plain thirty leagues in length, destitute of water. The whole of this country is in general of an alarming state of aridity; for the mountains *de los Mimbres*, situated to the east of the road from Durango to Santa Fe, do not give rise to a single brook. Notwithstanding the mildness of the climate, and the progress of industry, a great part of this country, as well as Old California, and several districts of New Biscay, and the intendancy of Guadalaxara, will never admit of any considerable population.

New Mexico, although under the same latitude with Syria and central Persia, has a remarkably cold climate. It freezes there in the middle of May. Near Santa Fe, and a little farther north (under the parallel of the Morea), the Rio del Norte is sometimes covered, for a succession of several years, with ice thick enough to admit the

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passage of horses and carriages. We are ignorant of the elevation of the soil of the province of New Mexico; but I do not believe that, under the 37° of latitude, the bed of the river is more than 7 or 800 metres * of elevation above the level of the ocean. The mountains which bound the valley of the Rio del Norte, and even those at the foot of which the village of Taos is situated, lose their snow towards the beginning of the month of June.

The *great river of the north*, as we have already observed, rises in the Sierra Verde, which is the point of separation between the streams which flow into the gulph of Mexico, and those which flow into the South Sea. It has its periodical rises. *(crecientes)* like the Orinoco, the Mississippi, and a great number of rivers of both continents. The waters of the Rio del Norte begin to swell in the month of April; they are at their height in the beginning of May; and they fall towards the end of June. The inhabitants can only ford the river on horses of an extraordinary size during the drought of summer, when the strength of the current is greatly diminished. These horses in Peru are called *caballos ahimbadores*. Several persons mount at once; and if the horse takes

* 2296 or 2624 feet. *Trans.*

footing occasionally in swimming, this mode of passing the river is called *passar el rio a volapie.*

The water of the Rio del Norte, like that of the Orinoco, and all the great rivers of South America, is extremely muddy. In New Biscay they consider a small river, called Rio Puerco *(nasty river)*, the mouth of which lies south from the town of Albuquerque, near Valencia, as the cause of this phenomenon; but M. Tamaron observed that its waters were muddy far above Santa Fe and the town of Taos. The inhabitants of the Passo del Norte have preserved the recollection of a very extraordinary event which took place in 1752. The whole bed of the river became dry all of a sudden for more than thirty leagues above, and twenty leagues below the Passo: and the water of the river precipitated itself into a newly-formed chasm, and only made its re-appearance near the Presidio de San Eleazario. This loss of the Rio del Norte remained for a considerable time; the fine plains which surround the Passo, and which are intersected with small canals of irrigation, remained without water; and the inhabitants dug wells in the sand, with which the bed of the river was filled. At length, after the lapse of several weeks, the water resumed its ancient course, no doubt because the chasm and the subterraneous conductors had filled up. This

phenomenon bears some analogy to a fact which I was told by the Indians of Jaen de Bracamorros during my stay at Tomependa. In the beginning of the eighteenth century the inhabitants of the village of Puyaya saw, to their great terror and astonishment, the bed of the river Amazons completely dried up for several hours. A part of the rocks near the cataract (pongo) of Rentema had fallen down through an earthquake; and the waters of the Maragnon had stopt in their course till they could get over the dike formed by the fall. In the northern part of New Mexico, near Taos, and to the north of that city, rivers take their rise which run into the Mississippi. The Rio de Pecos is probably the same with the Red River of the Natchitoches, and the Rio Napesila is, perhaps, the same river which, farther east, takes the name of Arkausas.

The colonists of this province, known for their great energy of character, live in a state of perpetual warfare with the neighbouring Indians. It is on account of this insecurity of the country life that we find the towns more populous than we should expect in so desert a country. The situation of the inhabitants of New Mexico bears, in many respects, a great resemblance to that of the people of Europe during the middle ages. So long as insulation exposes men to personal danger,

we can hope for the establishment of no equilibrium between the population of towns and that of the country.

However, the Indians who live on an intimate footing with the Spanish colonists are by no means all equally barbarous. Those of the east are warlike, and wander about from place to place. If they carry on any commerce with the whites, it is frequently without personal intercourse, and according to principles of which some traces are to be found among some of the tribes of Africa. The savages, in their excursions to the north of the Bolson de Mapimi, plant along the road between Chihuahua and Santa Fe small crosses, to which they suspend a leathern pocket, with a piece of stag flesh. At the foot of the cross a buffalo's hide is stretched out. The Indian indicates by these signs that he wishes to carry on a commerce of barter with those who place the cross. He offers the christian traveller a hide for provisions, of which he does not fix the quantity. The soldiers of the *presidios*, who understand the hieroglyphical language of the Indians, take away the buffalo hide, and leave some salted flesh at the foot of the cross*. This system of commerce indicates at once an extraordinary mixture of good faith and distrust.

* *Diario del Viage, Señor Tamaron*, (M.S.)

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The Indians to the west of the Rio del Norte, between the rivers Gila and Colorado, form a contrast with the wandering and distrustful Indians of the savannas to the east of New Mexico. Father Garces is one of the latest missionaries who in 1773 visited the country of the *Moqui*, watered by the Rio de Yaquesila. He was astonished to find there an Indian town with two great squares, houses of several stories, and streets well laid out, and parallel to one another. Every evening the people assembled together on the terraces, of which the roofs of the houses are formed. The construction of the edifices of the Moqui is the same with that of the *Casas grandes* on the banks of the Rio Gila, of which we have already spoken. The Indians who inhabit the northern part of New Mexico give also a considerable elevation to their houses, for the sake of discovering the approach of their enemies. Every thing in these countries appears to announce traces of the cultivation of the ancient Mexicans. We are informed, even by the Indian traditions, that twenty leagues north from the Moqui, near the mouth of the Rio Zaguananas, the banks of the Nabajoa were the first abode of the Aztecs after their departure from Aztlan. On considering the civilization which exists on several points of the north-west coast of America, in the Moqui

STATISTICAL ANALYSIS. XIII. *Province of Nuevo Mexico.*

and on the banks of the Gila, we are tempted to believe (and I venture to repeat it here) that at the period of the migration of the Toltecs the Acolhues, and the Aztecs, several tribes separated from the great mass of the people to establish themselves in these northern regions. However, the language spoken by the Indians of the Moqui, the Yabipais, who wear long beards, and those who inhabit the plains in the vicinity of the Rio Colorado, is essentially different* from the Mexican language.

In the 17th century several missionaries of the order of St. Francis established themselves among the Indians of the Moqui and Nabajoa, who were massacred in the great revolt of the Indians in 1680. I have seen in manuscript maps drawn up before that period the name of the *Provincia del Moqui.*

The province of New Mexico contains three *villas* (Santa Fe, Santa Cruz de la Cañada y Taos, and Albuquerque y Alameda), 26 *pueblos*, or villages, 3 *parroquias*, or parishes, 19 missions, and no solitary farm (*rancho*).

* See the testimony of several missionary monks well versed in the knowledge of the Aztec language (*Chronica Serafica del Collegio de Queretaro*, p. 408.)

STATISTICAL ANALYSIS. } XIII. *Province of Nuevo Mexico.*

Santa Fe, the capital, to the east of the great Rio del Norte.—Population, 3,600.

Albuquerque, opposite the village of Atrisco, to the west of the Sierra Obscura.—Population, 6,000.

Taos, placed in the old maps 62 leagues too far north under the 40° of latitude.—Population, 8,900.

Passo del Norte, presidio or military post on the right bank of the Rio del Norte, separated from the town of Santa Fe by an uncultivated country of more than 60 leagues in length. We must not confound this place, which some manuscript maps in the archives of Mexico consider as a dependance of New Biscay, with the *Presidio del Norte*, or *de las Juntas*, situated further to the south, at the mouth of the Rio Conchos. Travellers stop at the Passo del Norte to lay in the necessary provisions for continuing their route to Santa Fe. The environs of the Passo are delicious, and resemble the finest parts of Andalusia. The fields are cultivated with maize and wheat; and the vineyards produce such excellent sweet wines that they are even preferred to the wines of Parras in New Biscay. The gardens contain in abundance all the fruits of Europe, figs, peaches, apples and pears. As the country is very dry, a canal of irrigation brings the water of the Rio del Norte to the Passo. It is with difficulty that the inhabitants of the presidio can keep up the dam,

which forces the waters of the rivers when they are very low to enter into the canal *(azequia)*. During the great swells of the Rio del Norte, the strength of the current destroys this dam almost every year in the months of May and June. The manner of restoring and strengthening the dam is very ingenious. The inhabitants form baskets of stakes, connected together by branches of trees, and filled with earth and stones. These gabions *(cestones)* are abandoned to the force of the current, which in its eddies disposes them in the point where the canal separates from the river.

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
XIV. Province of Old California.	,0)	7,295	1

THE history of geography affords several examples of countries of which the position was known to the first navigators, but which were long regarded as having only been discovered at more recent epoquas. Such are the Sandwich Islands, the west coast of New Holland, the great Cyclades, formerly called by Quiros the Archipelago *del Espiritu Santo*, the land of the Arsacides seen by Mendaña, and particularly the coast of California. This last country was recognized as a peninsula before the year 1541; and yet 160 years later the merit was attributed to Father *Kühn* (Kino) of having first proved that California was not an island, and that it was connected with the main land of Mexico.

Cortez, after astonishing the world with his exploits on the continent, displayed an energy of character no less admirable in his maritime undertakings. Restless, ambitious, and tormented with the idea of seeing the country which his courage had conquered at one time under the administration of a corregidor of Toledo, and at another, of

a president of the audiencia, or a bishop of St. Domingo *, he gave himself completely up to expeditions of discovery in the South Sea. He seemed to forget that the powerful enemies which he had at court were merely stirred up by the magnitude and rapidity of his successes, and he flattered himself that he would compel them to silence by the brilliancy of the new career which opened to his activity. On the other hand, the government, which distrusted a man of such extraordinary merit, encouraged him in his design of traversing the ocean. Believing that after the conquest of Mexico his military talents were no longer needed, the emperor was very well pleased to see him plunged in hazardous enterprizes; and he was particularly desirous of seeing him removed to a distance from the theatre where his courage and audacity had already shone so conspicuously.

So early as 1523, Charles V., in a letter dated from Valladolid, recommended to Cortez to seek on the eastern and western coasts of New Spain for the *secret of a strait* (el secreto del estrecho), which should shorten by two-thirds the navigation from Cadiz to the East Indies, then called

* The corregidor, Luis Ponce de Leon; the president, Nuño de Guzman; and the bishop, Sebastian Ramirez de Fuenleal.

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the *Country of Spices.* Cortez, in his answer to the emperor, speaks with the greatest enthusiasm of the probability of this discovery, "which," he adds, "will render your majesty master of so many kingdoms that you will be considered as the monarch of the whole world*." It was in the course of one of these navigations, undertaken at the particular expense of Cortez, that the coast of California was discovered by Hernando de Grixalva in the month of February, 1534†. His pilate, Fortun Ximenez, was killed by the Californians in the bay of Santa Cruz, called afterwards the Port de la Paz, or of the Marquis del Valle. Discontented with the tediousness and unsuccessfulness of the discoveries in the South Sea, Cortez himself embarked in 1535 with 400 Spaniards and 300 negro-slaves at the port of

* *Cartes de Cortez*, p. 374, 382, 385.

† I found in a manuscript preserved in the archives of the viceroyalty of Mexico, that California was discovered in 1526. I know not on what authority this assertion is founded. Cortez, in his letters to the emperor, written so late as 1524, frequently speaks of the pearls which were found near the islands of the South Sea; however, the extracts made by the author of the Relacion del Viage al Estrecho de Fuca (p. vii. xxii.) from the valuable manuscripts preserved in the Academy of History at Madrid, seem to prove that California had not even been seen in the expedition of Diego Hurtado de Mendoza in 1532.

Chiametlan (*Chametla*). He coasted both sides of the gulf, then known by the name of the *Sea of Cortez*, and which the historian Gomara compared very judiciously in 1557 to the Adriatic Sea. It was during his stay at the bay of Santa Cruz that the afflicting news reached Cortez of the arrival of the first viceroy at New Spain. This great conqueror was pursuing with unabated ardour his discoveries in California, when the report of his death was spread at Mexico. Juana de Zuñiga, his spouse, fitted out two vessels and a *caravele* to learn the truth of this alarming information. However, Cortez, after running a thousand dangers, anchored safely at the port of Acapulco. He continued to pursue at his own expense, through Francisco de Ulloa, the career which he had so gloriously begun; and Ulloa, in the course of two years, ascertained the coasts of the gulf of California, to near the mouth of the Rio Colorado.

The map drawn up by the pilot Castillo at Mexico in 1541, which we have already several times cited, represents the direction of the coasts of the peninsula of California nearly as we know them at present. Notwithstanding this progress of geography under the activity of Cortez, several writers under the weak reign of Charles the Second began to consider California as an archipelago

STATISTICAL ANALYSIS. } XIV. *Province of Old California.*

of great islands called *Islas Carolinas*. The pearl fishery only drew from time to time a few vessels from the ports of Xalisco, Acapulco, or Chacala; and when three jesuits, Fathers Kühn, Salvatierra, and Uguarte, visited most minutely between 1701 and 1721 the coasts which surrounded the sea of Cortez (*mar roxo ò vermejo*), it was believed in Europe to have been discovered for the first time that California was a peninsula.

The more imperfectly any country is known, and the farther it is removed from the best peopled European colonies, it more easily acquires a reputation for great metallic wealth. The imaginations of men are delighted with the recitals of wonders which the credulity or the cunning of the first travellers delivers in a mysterious and ambiguous tone. On the Caraccas coast the wealth of the countries situated between the Orinoco and the Rio Negro are highly extolled; at Santa Fe we hear the missions of the Andaquies incessantly vaunted; and at Quito the provinces of Macas and Maynos. The peninsula of California was for a long time the *Dorado* of New Spain. A country abounding in pearls ought, according to the vulgar logic, also to produce gold diamonds and other precious stones in abundance. A monkish traveller, Fray Marcos de Nizza, turned the heads of the Mexicans by the fabulous ac-

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counts which he gave of the beauty of the country situated to the north of the gulf of California, of the magnificence of the town of Cibola*, of its immense population, and of its police and the civilization of its inhabitans. Cortez and the viceroy Mendoza disputed before-hand the conquest of this Mexican *Tombouctou*. The establishments made by the jesuits in California since 1683 made known the great aridity of the country, and the great difficulty of bringing it under

* The old manuscript map of Castillo places the fabulous town of Cibola, or Cibora, under the 37° of latitude. But on reducing its position to that of the mouth of the Rio Colorado, we are tempted to believe that the ruins of the *Casas grandes* of the Gila, mentioned in the description of the intendancy of Sonora, may have given occasion to the stories told by good Father Marcos de Nizza. However, the great civilization which this monk affirms to have found among the inhabitants of these northern countries appears to me a fact of considerable importance, which is connected with what we have already related of the Indians of the Rio Gila and the Moqui. The authors of the 16th century placed a second *Dorado* to the north of Cibora under the 41° of latitude. According to them, the kingdom of Tatarrax, and an immense town called *Quivira*, were to be found there on the banks of the lake of Teguayo, near the Rio del Aguilar. This tradition, if it is founded on the assertion of the Indians of Anahuac, is remarkable enough; for the banks of the lake of Teguayo, which is, perhaps, identical with the lake of Timpanogos, are indicated by the Aztec historians as the country of the Mexicans.

STATISTICAL ANALYSIS. } XIV. *Province of Old California.*

cultivation; and the bad success which attended the mining operations at Santa Ana, to the north of Cape Pulmo, diminished the enthusiasm excited by the marvellous accounts of the metallic wealth of the peninsula. But the grudge and the hatred entertained against the jesuits gave rise to the suspicion that this order concealed from the government the treasures of a country so long extolled. These considerations determined the visitador Don Jose de Galvez, whom a chivalrous disposition had engaged in an expedition against the Indians of Sonora, to pass over into California. He found there naked mountains without soil and without water; and a few Indian fig trees and stunted shrubs in the crevices of the rocks. There was no indication of the gold and silver which the jesuits were accused of extracting from the bowels of the earth; but every where they perceived traces of their industry and the praiseworthy zeal with which they applied to cultivate a desert and arid country. In the course of this Californian expedition, the visitador Galvez was accompanied by the Chevalier d'Asanza, a man as remarkable for his talents as for the great vicissitudes of fortune which he has experienced, who acted as secretary under M. Galvez. He declared frankly what was soon much better proved by the operations of the small army than by the physicians of Pitic,

STATISTICAL ANALYSIS. } XIV. *Province of Old California.*

that the visitador was deranged in mind. M. d'Asanza was apprehended and confined for five months in a prison in the village of Tepozotlan, where, thirty years afterwards, he made his solemn entry as viceroy of New Spain.

The peninsula of California, which equals England in extent of territory, and does not contain the population of the small towns of Ipswich or Deptford, lies under the same parallel with Bengal and the Canary Islands. The sky is constantly serene and of a deep blue, and without a cloud; and should any clouds appear for a moment at the setting of the sun, they display the most beautiful shades of violet, purple, and green. All those who had ever been in California (and I have seen many in New Spain) preserved the recollection of the extraordinary beauty of this phenomenon, which depends on a particular state of the vesicular vapour, and the purity of the air in these climates. No where could an astronomer find a more delightful abode than at Cumana, Coro, the island of Marguerite, and the coast of California. But unfortunately in this peninsula the sky is more beautiful than the earth. The soil is sandy and arid, like the shores of Provence; vegetation is at a stand; and rain is very unfrequent.

A chain of mountains runs through the centre of the peninsula, of which the most elevated, the

Cerro de la Giganta, is from fourteen to fifteen hundred metres* in height, and appears of volcanic origin. This Cordillera is inhabited by animals, which from their form and their habits resemble the *mouflon* (ovis ammon) of Sardinia, of which Father Consag has given but a very imperfect account. The Spaniards call them wild sheep (*carneros cimarones*). They leap, like the ibex, with their head downwards; and their horns are curved on themselves in a spiral form. According to the observations of M. Costanzo †, this animal differs essentially from the wild goats, which are of an ashy white (*blanc cendré*), larger and peculiar to New California, especially to the Sierra de Santa Lucia, near Monterey. Moreover, these goats, which belong, perhaps, to the antelope race, go in the country by the name of *berendos*, and, like the chamois, have their horns curved backwards.

At the foot of the mountains of California we

* From 4592 to 4920 feet. *Trans.*

† Journal of a voyage to Old California and to the port of San Diego, drawn up in 1769, (MS). This interesting journal had been already printed at Mexico, when by orders of the ministry all the copies were confiscated. It is to be desired for the progress of zoology, that we should speedily know from the care of travellers the true specific characters which distinguish the *carneros cimarones* of Old California from the *berendos* of Monterey.

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discover only sand, or a stony stratum, on which cylindrical cacti (*organos del tunal*) shoot up to extraordinary heights. We find few springs; and, through a particular fatality, it is remarked that the rock is naked where the water springs up, while there is no water where the rock is covered with vegetable earth. Wherever springs and earth happen to be together, the fertility of the soil is immense. It was in these points, of which the number is far from great, that the jesuits established their first missions. The maize, the jatropha, and the dioscorea, vegetate vigorously; and the vine yields an excellent grape, of which the wine resembles that of the Canary Islands. In general, however, Old California, on account of the arid nature of the soil and the want of water and vegetable earth in the interior of the country, will never be able to maintain a great population any more than the northern part of Sonora, which is almost equally dry and sandy.

Of all the natural productions of California the pearls have, since the 16th century, been the chief attraction to navigators for visiting the coast of this desert country. They abound particularly in the southern part of the peninsula. Since the cessation of the pearl fishery near the island of Marguerite, opposite the coast of Araya, the gulfs of Panama and California are the only quarters in

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the Spanish colonies which supply pearls for the commerce of Europe. Those of California are of a very beautiful water and large; but they are frequently of an irregular figure, disagreeable to the eye. The shell which produces the pearl is particularly to be found in the Bay of Ceralvo, and round the islands of Santa Cruz and San Jose. The most valuable pearls in the possession of the court of Spain were found in 1615 and 1665, in the expeditions of Juan Yturbi and Bernal de Piñadero. During the stay of the visitador Galvez in California, in 1768 and 1769, a private soldier in the presidio of Loreto, *Juan Ocio,* was made rich in a short time by pearl fishing on the coast of Ceralvo. Since that period the number of pearls of California brought annually to market is almost reduced to nothing. The Indians and negros, who follow the severe occupation of divers, are so poorly paid by the whites, that the fishery is considered as abandoned. This branch of industry languishes from the same causes which in South America have raised the price of the Peruvian sheep skins, the caoutchouc, and the febrifugal bark of the quinquina.

Although Hernan Cortez spent more than 200,000 ducats of his patrimony* in his Califor-

* Upwards of 43,000*l.* sterling. *Patrimony* is not the cor-

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nian expeditions; and formal possession of the peninsula was taken by Sebastian Viscaino, who deserves to be placed in the first rank of the navigators of his age; it was only in 1642* that the jesuits were able to form solid establishments there. Jealous of their power, they struggled successfully against the efforts of the monks of St. Francis, who endeavoured from time to time to introduce themselves among the Indians. They had still more difficult enemies to overcome, the soldiers of the military posts; for in the extremities of the Spanish possessions of the New Continent, on the limits of European civilization, the legislative and executive powers are distributed in a very strange manner. The poor Indian knows no other master than a corporal or a missionary.

rect expression in this place, but *property*. Cortez's patrimony was never very great; and Bernal Diaz states, that what he had was expended on costly presents and preparations for his new-married wife, of whom he was very fond, before he set out on his celebrated expedition from the island of Cuba. *Trans.*

* It is advanced only a few pages before this that the jesuits commenced their settlements in Old California in 1683; and we see a few lines after this that the foundation of Loreto, under the name of Presidio de San Dionisio, was only laid in 1697, and that the Spanish establishments in California became only considerable after 1744. Should not, therefore, the 1642 be 1742? *Trans.*

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In California the jesuits obtained a complete victory over the soldiery posted in the presidios. The court decided by a *cedula real*, that all the detachment of Loreto, even the captain, should be under the command of the father at the head of the missions. The interesting voyages of three jesuits, Eusebius Kühn, Maria Salvatierra, and Juan Uguarte, brought us acquainted with the physical situation of the country. The village of Loreto had been already founded, under the name of Presidio de San Dionisio, in 1697. Under the reign of Philip V. especially after the year 1744, the Spanish establishments in California became very considerable. The jesuits displayed there that commercial industry and that activity to which they are indebted for so many successes, and which have exposed them to so many calumnies in both Indies. In a very few years they built 16 villages in the interior of the peninsula. Since their expulsion in 1767, California has been confided to the dominican monks of the city of Mexico; and it appears that they have not been so successful in their establishments of Old California, as the Franciscans have been on the coasts of New California.

The natives of the peninsula who do not live in the missions are of all savages, perhaps, the nearest to what has been called the state of nature,

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They pass whole days stretched out on their bellies on the sand, when it is heated by the reverberation of the solar rays. Like several tribes of the Orinoco seen by us, they entertain a great horror for clothing. "A monkey dressed up does not appear so ridiculous to the common people in Europe," says Father Venegas, "as a man in clothes appears to the Indians of California." Notwithstanding this state of apparent stupidity, the first missionaries distinguished different religious sects among the natives. Three divinities, who carried on a war of extermination against each other, were objects of terror among three of the tribes of California. The Pericues dreaded the power of Niparaya, and the Menquis and the Vehities the power of Wactipuran and Sumongo. I say that these hordes dreaded, not that they adored, invisible beings; for the worship of the savage is merely a fit of fear, the sentiment of a secret and religious horror.

According to the information which I obtained from the monks who now govern the two Californias, the population of Old California has diminished to such a degree within the last thirty years, that there are not more than from four to five thousand native cultivators (*Indios reducidos*) in the villages of the missions. The number of these missions is also reduced to sixteen. Those of

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Santiago and Guadalupe remain without inhabitants. The small-pox, and another malady which the Europeans would fain persuade themselves that they received from the same continent to which they were the first who carried it, and which exercises such ravages in the South Sea islands, are cited as the principal causes of the depopulation of California. It is to be supposed that there are others which depend on the nature of the political institutions; and it is high time that the Mexican government should seriously think of removing the obstacles which prevent the prosperity of the inhabitants of the peninsula. The number of the savages scarcely amounts to 4000. It is observed that those who inhabit the north of California are somewhat more gentle and civilized than the natives of the southern division.

The principal villages of this province are:

Loreto, presidio and principal place of all the missions of Old California, founded at the end of the 17th century by Father Kühn, the astronomer of Ingolstadt.

Santa Ana, mission and *real de minas*, celebrated on account of the astronomical observations of Velasquez.

San Joseph, mission in which the Abbe Chappe

perished, the victim of his zeal and devotion for the sciences*.

* People who have lived a long time in California have assured me, that the *Noticia* of Father Venegas, against which the enemies of the suppressed order, and even Cardinal Lorenzana, have raised up doubts, is very accurate (Cartas de Cortes, p. 327). There still exist in the archives of Mexico the following *manuscripts*, not made use of by *Father Barcos* in his *Storia de California*, printed at Rome: 1. *Chronica historica de la provincia de Mechoacan con varias mapas de la California*; 2. *Cartas originales del Padre Juan Maria de Salvatierra*; 3. *Diario del Capitan Juan Mateo Mangi que accompanò a los padres apostolicos Kinò y Kappus.*

STATISTICAL ANALYSIS.	Population in 1803.	Extent of Surface in square Leagues.	No. of Inhabitants to the square League.
XV. Intendancy of New California.	15,600	2,125	7

THE part of the coast of the Great Ocean which extends from the isthmus of Old California or from the bay of Todos los Santos (south from the port of San Diego) to Cape Mendocino, bears on the Spanish maps the name of New California (*Nueva California*). It is a long and narrow extent of country in which for these forty years the Mexican government has been establishing missions and military posts. No village or farm is to be found north of the port of St. Francis, which is more than 78 leagues distant from Cape Mendocino. The province of New California in its present state is only 197 leagues in length, and from 9 to 10 in breadth. The city of Mexico is the same distance in a straight line from Philadelphia as from Monterey, which is the chief place of the missions of New California, and of which the latitude is the same to within a few minutes with that of Cadiz.

We have already taken notice of the journies of several monks, who, in the beginning of the last century, in passing by land from the peninsula of

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Old California to Sonora went on foot round the sea of Cortez. At the time of the expedition of M. Galvez military detachments came from Loreto to the port of San Diego. The letter-post still goes from this port along the north-west coast to San Francisco. This last establishment, the most northern of all the Spanish possessions of the New Continent, is almost under the same parallel* with the small town of Taos in New Mexico. It is not more than 300 leagues distant from it; and though Father Escalante, in his apostolical excursions in 1777, advanced along the western bank of the river Zaguananas towards the mountains *de los Guacaros*, no traveller has yet come from New Mexico to the coast of New California. This fact must appear remarkable to those who know, from the history of the conquest of America, the spirit of enterprize and the wonderful courage with which the Spaniards were animated in the 16th century. Hernan Cortez landed for the first time on the coast of Mexico in the district of Chalchiuhcuecan in 1519, and in the space of four years had already constructed vessels on the coast of the South Sea at Zacatula and Tehuantepec. In 1537 Alvar Nuñez Cabeza de Vaca appeared with two of his companions

* See the first chapter of this work.

worn out with fatigue, naked, and covered with wounds, on the coast of Culiacan, opposite the peninsula of California. He had landed with Panfilo Narvaez in Florida, and after two years excursions, wandering over all Louisiana and the northern part of Mexico, he arrived at the shore of the great ocean in Sonora. This space, which Nuñez went over, is almost as great as that of the route followed by Captain Lewis from the banks of the Mississipipi to Nootka and the mouth of the river Columbia*. When we consider the bold undertakings of the first Spanish conquerors in Mexico, Peru, and on the Amazons' river, we are astonished to find that for two centuries the same nation could not find a road by land in New Spain from Taos to the port of Monterey; in New Grenada, from Santa Fe to Carthagena, or from Quito to Panama; and in Guayana, from l'Esmeralda to S. Thomas del'Angostura!

From the example of the English maps, several geographers give the name of *New Albion* to New California. This denomination is founded on the very inaccurate opinion that the navigator Drake

* This wonderful journey of Captain Lewis was undertaken under the auspices of M. Jefferson, who by this important service rendered to science has added new claims on the gratitude of the *savans* of all nations.

first discovered, in 1578, the north-west coast of America between the 38° and the 48° of latitude. The celebrated voyage of Sebastian Viscaino is, no doubt, 24 years posterior to the discoveries of Francis Drake; but Knox* and other historians seem to forget that Cabrillo had already examined in 1542 the coast of New California to the parallel of 43°, the boundary of his navigation, as we may see from a comparison of the old observations of latitude with those taken in our own days. According to some historical data, the denomination of *New Albion* ought to be limited to that part of the coast which extends from the 43° to the 48°, or from *Cape White of Martin de Aguilar* to the *entrance of Juan de Fuca* †. Besides from the missions of the catholic priests to those of the Greek priests, that is to say, from the Spanish village of San Francisco in New California to the Russian establishments on Cook river at Prince William's bay, and to the islands of Kodiac and Unalaska, there are more than a thousand leagues of coast inhabited by free men, and stocked with otters and Phocæ! Consequently, the discussions

* Knox's Collection of Voyages, vol. III. p. 18.

† See the learned researches in the introduction of the *Viage de las Goletas Sutil y Mexicana*, 1802, p. xxxiv. xxxvi. lvii

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on the extent of the New Albion of Drake, and the pretended rights acquired by certain European nations from planting small crosses and leaving inscriptions fastened to trunks of trees, or the burying of bottles, may be considered as futile.

Although the whole shore of New California was carefully examined by the great navigator Sebastian Viscaino (as is proved by plans drawn up by himself in 1602), this fine country was only, however, occupied by the Spaniards 167 years afterwards. The court of Madrid dreading lest the other maritime powers of Europe should form settlements on the north-west coast of America which might become dangerous to the Spanish colonies, gave orders to the Chevalier de Croix, the viceroy, and the Visitador Galvez, to found missions and *presidios* in the ports of San Diego and Monterey. For this purpose two packet-boats set out from the port of San Blas, and anchored at San Diego in the month of April, 1763. Another expedition arrived by land through Old California. Since Viscaino, no European had disembarked on these distant coasts. The Indians were quite astonished to see men with clothes, though they knew that farther east there were men whose complexion was not of a coppery colour. There was even found among them several pieces of silver, which had undoubtedly come from New

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Mexico. The first Spanish colonists suffered a great deal from scarcity of provisions and an epidemical disease, the consequence of the bad quality of their food, their fatigues, and the want of shelter. Almost all of them fell sick, and only eight individuals remained on their feet. Amongst these were two respectable men, Fray Junipero Serra, a monk known from his travels, and M. Costanzo, the head of the engineers, in whose praise we have already so often spoken in the course of this work. They were employed in digging graves to receive the bodies of their companions.* The land expedition was very late in arriving with assistance to this unfortunate infant colony. The Indians, to announce the arrival of the Spaniards, placed themselves on casks with their arms out, to show that they had seen whites on horseback.

The soil of New California is as well watered and fertile as that of Old California is arid and stony. It is one of the most picturesque countries which can be seen. The climate is much more mild there than in the same latitude on the eastern coast of the new continent. The sky is foggy, but the frequent fogs which render it difficult to land on the coast of Monterey and San Francisco give vigour to vegetation and fertilize the soil, which is covered with a black and spongy earth.

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In the eighteen missions which now exist in New California, wheat, maize, and haricots (*frisoles*), are cultivated in abundance. Barley, beans, lentiles, and *garbanzos*, grow very well in the fields in the greatest part of the province. As the thirty-six monks of St. Francis who govern these missions are all Europeans, they have carefully introduced into the gardens of the Indians the most part of the roots and fruit trees cultivated in Spain. The first colonists found, on their arrival there, in 1769, shoots of wild vines in the interior of the country, which yielded very large grapes of a very sour quality. It was, perhaps, one of the numerous species of vitis peculiar to Canada, Louisiana, and New Biscay, which are still very imperfectly known to botanists. The missionaries introduced into California the vine (*vitis vinifera*), of which the Greeks and Romans diffused the cultivation throughout Europe, and which is certainly a stranger to the new continent. Good wine is made in the villages of San Diego, San Juan Capistrano, San Gabriel, San Buenaventura, Santa Barbara, San Luis Obispo, Santa Clara, and San Jose, and all along the coast, south and north of Monterey, to beyond the 37° of latitude. The European olive is successfully cultivated near the canal of Santa Barbara, especially near San Diego, where an oil is made as good as that of

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the valley of Mexico, or the oils of Andalusia. The very cold winds which blow with impetuosity from the north and north-west, sometimes prevent the fruits from ripening along the coast; but the small village of Santa Clara, situated nine leagues from Santa Cruz and sheltered by a chain of mountains, has better planted orchards and more abundant harvests of fruit than the *presidio* of Monterey. In this last place, the monks show travellers, with satisfaction, several useful vegetables, the produce of the seeds given by M. Thouin to the unfortunate Laperouse.

Of all the missions of New Spain those of the north-west coast exhibit the most rapid and remarkable progress in civilization. The public having taken an interest in the details published by Laperouse, Vancouver, and two recent Spanish navigators, MM. Galiano and Valdes*, on the state of these distant regions, I endeavoured to procure during my stay at Mexico the statistical tables drawn up in 1802 on the very spot (at San Carlos de Monterey) by the present president of the missions of New California, Father Firmin Lasuen †. From the comparison which I made

* *Viage de la Sutil*, p. 167.

† See the extract from these tables in note D. at the end of this work.

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of the official papers preserved in the archives of the archbishopric of Mexico, it appears that in 1776 there were only 8 and in 1790 11 villages; while in 1802 the number amounted to 18. The population of New California, including only the Indians attached to the soil who have begun to cultivate their fields, was

in 1790,	- -	7,748 souls
in 1801,	- -	13,668
and in 1802,	- -	15,562

Thus the number of inhabitants has doubled in 12 years. Since the foundation of these missions, or between 1769 and 1802, there were in all, according to the parish registers, 33,717 baptisms, 8009 marriages, and 16,984 deaths. We must not attempt to deduce from these data the proportion between the births and deaths, because in the number of baptisms the adult Indians (*los neofitos*) are confounded with the children.

The estimation of the produce of the soil, or the harvests, furnishes also the most convincing proofs of the increase of industry and prosperity of New California. In 1791, according to the tables published by M. Galiano, the Indians sowed in the whole province only 874 *fanegas* of wheat, which yielded a harvest of 15,197 *fanegas*. The cultivation doubled in 1802; for the quantity of

wheat sown was 2089 *fanegas*, and the harvest 33,576 *fanegas*.

The following table contains the number of live stock in 1802.

Beeves.	Sheep.	Hogs.	Horses.	Mules.
67,782	107,172	1,010	2,187	877

In 1791 there were only 24,958 head of black cattle (*ganado mayor*) in the whole of the Indian villages.

This progress of agriculture, this peaceful conquest of industry is so much the more interesting, as the natives of this coast, very different from those of Nootka and Norfolk bay, were only thirty years ago a wandering tribe, subsisting on fishing and hunting, and cultivating no sort of vegetables. The Indians of the bay of S. Francisco were equally wretched at that time with the inhabitants of Van Diemen's Land. The natives were found somewhat more advanced in civilization in 1769 only in the canal of Santa Barbara. They constructed large houses of a pyramidal form close to one another. They appeared benevolent and hospitable; and they presented the Spaniards with vases very curiously wrought of stalks of rushes. M. Bonpland possesses several of these vases in his collections, which are covered within with a

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very thin layer of asphaltus, that renders them impenetrable to water, or the strong liquors which they may happen to contain.

The northern part of California is inhabited by the two nations of the Rumsen and Escelen*. They speak languages totally different from one another, and they form the population of the *presidio* and the village of Monterey. In the bay of San Francisco the languages of the different tribes of the Matalans, Salsen, and Quirotes, are derived from a common root. I have heard several travellers speak of the analogy between the Mexican or Aztec language, and the idioms of the north-west coast of North America. It appeared to me, however, that they exaggerated the resemblance between these American languages. On examining carefully the vocabularies formed at Nootka and Monterey, I was struck with the similarity of tone and termination to those of Mexico in several words, as, for example, in the language of the Nootkians: *apquixitl* (to embrace), *temextixitl* (to kiss), *cocotl* (otter), *hitlzitl* (to sigh), *tzitzimitz* (earth), and *incoatzimitl* (the name of a month). However, the languages of New California and the island of Quadra differ in general

* *Manuscript of Father Lasuen.* M. de Galeano calls them Rumsien and Eslen.

essentially from the Aztec, as may be seen in the cardinal numbers brought together in the following table.

Mexican.	*Escelen.*	*Rumsen.*	*Nootka.*
1. Ce - -	Pek - - -	Enjala - -	Sahūac
2. Ome -	Ulhai - -	Ultis - -	Atla
3. Jei - -	Julep - -	Kappes - -	Catza
4. Nahui -	Jamajus - -	Ultuzim -	Nu
5. Macuilli	Pammjala -	Haliizu - -	Sutcha
6. Chicuace	Pegualanai -	Halishakem	Nupu
7. Chicome	Julajualanai -	K[illegible]aishakem	Atlipu
8. Chicuei	Julepjualanai	Ultumaishakem	Atlcual.
9. Chucuahui	Jamajusjualanai	Pakke - -	Tzahuacuatl
10. Matlactli	Tomoila -	Tamchaigt -	Ayo

The Nootka words are taken from a manuscript of *M. Mozino*, and not from Cook's vocabulary, in which ayo is confounded with haecoo, nu with mo, &c. &c.

Father Lasuen observed that on an extent of 180 leagues of the coast of California from San Diego to San Francisco, no fewer than 17 languages are spoken, which can hardly be considered as dialects of a small number of mother-languages. This assertion will not astonish those who know the curious researches of MM. Jefferson, Volney, Barton, Hervas, William de Humboldt, Vater, and Frederic Schlegel*, on the subject of the American languages.

* See the classical work of M. Schlegel on the language,

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The population of New California would have augmented still more rapidly if the laws by which the Spanish *presidios* have been governed for ages were not directly opposite to the true interests of both mother-country and colonies. By these laws the soldiers stationed at Monterey are not permitted to live out of their barracks and to settle as colonists. The monks are generally averse to the settlement of colonists of the white cast, because being *people who reason* (gente de razon*) they do not submit so easily to a blind obedience as the Indians. "It is truly distressing," (says a well-informed and enlightened Spanish navigator†) "that the military, who pass a painful and laborious life, cannot in their old age settle in the country and employ themselves in agriculture. The prohibition of building houses in the neighbourhood of the presidio is contrary to all the dictates of sound policy. If the whites were permitted to employ themselves in the cultivation of the soil and the

philosophy, and poetry of the Hindoos, in which are to be found very enlarged views relative to the mechanism, I may say the organization, of the languages of the two continents.

* In the Indian villages the natives are distinguished from the *gente de razon*. The whites, mulattoes, negros, and all the casts which are not *Indians* go under the designation of *gente de razon;* a humiliating expression for the natives, which had its origin in ages of barbarism.

† *Journal of Don Dionisio Galiano.*

rearing of cattle, and if the military, by establishing their wives and children in cottages, could prepare an asylum against the indigence to which they are too frequently exposed in their old age, New California would soon become a flourishing colony, a resting place of the greatest utility for the Spanish navigators who trade between Peru, Mexico, and the Philippine Islands." On removing the obstacles which we have pointed out, the Malouine Islands, the missions of the Rio Negro, and the coasts of San Francisco and Monterey, would soon be peopled with a great number of whites. But what a striking contrast between the principles of *colonization* followed by the Spaniards, and those by which Great Britain has created in a few years villages on the eastern coast of New Holland!

The Rumsen and Escelen Indians share with the nations of the Aztec race, and several of the tribes of northern Asia, a strong inclination for warm baths. The temazcalli, still found at Mexico, of which the Abbe Clavigero has given an exact representation*, are true vapour baths. The Aztec Indian remains stretched out in a hot oven, of which the flags are continually watered; but the natives of New California use the bath formerly

* *Clavigero*, II. p. 214.

recommended by the celebrated Franklin, under the name of *warm air bath.* We accordingly find in the missions beside each cottage a small vaulted edifice in the form of a temazcalli. Returning from their labour, the Indians enter the oven, in which, a few moments before, the fire has been extinguished; and they remain there for a quarter of an hour. When they feel themselves covered over with perspiration, they plunge into the cold water of a neighbouring stream, or wallow about in the sand. This rapid transition from heat to cold, and the sudden suppression of the cutaneous transpiration which an European would justly dread, causes the most agreeable sensations to the savage, who enjoys whatever strongly agitates him or acts with violence on his nervous system*.

The Indians who inhabit the villages of New California have been for some years employed in spinning coarse woollen stuffs, called *frisadas.* But their principal occupation, of which the produce might become a very considerable branch of commerce, is the dressing of stag skins. It appears to me that it may not be uninteresting to relate here what I could collect from the manuscript journals of Colonel Costanzo, relative to the ani-

* Most readers probably know that this transition from hot to cold bathing is practised also in Russia. *Trans.*

mals which live in the mountains between San Diego and Monterey, and the particular address with which the Indians get possession of the stags.

In the cordillera of small elevation which runs along the coast, as well as in the neighbouring savannas, there are neither buffalos nor elks; and on the crest of the mountains which are covered with snow in the month of November, the *berendos*, with small chamois horns, of which we have already spoken, feed by themselves. But all the forest and all the plains covered with gramina are filled with flocks of stags of a most gigantic size, the branches of which are round and extremely large. Forty or fifty of them are frequently seen at a time: they are of a brown colour, smooth, and without spot. Their branches, of which the seats of the antlers are not flat, are nearly 15 decimetres* (4$\frac{1}{2}$ feet) in length. It is affirmed by every traveller, that this great stag of New California is one of the most beautiful animals of Spanish America. It probably differs from the *wewakish* of M. Hearne, or the *elk* of the United States, of which naturalists have very improperly made the two species of cervus canadensis, and cervus strongyloceros †. These stags of New California,

* 4 feet 11 inches English. *Trans.*

† There still prevails a good deal of uncertainty as to the specific characters of the great and small stags (*venados*) of

not to be found in Old California, formerly struck the navigator Sebastian Biscayno, when he put into the port of Monterey on the 15th December, 1602. He asserts "that he saw some, of which the branches were three metres (nearly nine feet) in length." These venados run with extraordinary rapidity, throwing their head back, and supporting their branches on their backs. The horses of New Biscay, which are famed for running, are incapable of keeping up with them; and they only reach them at the moment when the animal, who very seldom drinks, comes to quench his thirst. He is then too heavy to display all the energy of his muscular force, and is easily come up with. The hunter who pursues him gets the better of him by means of a noose, in the same way as they manage wild horses and cattle in the Spanish colonies. The Indians make use, however, of another very ingenious artifice to approach the stags and kill them. They cut off the head of a *venado*, the branches of which are very long; and they empty the neck, and place it on their own head. Masked in this manner, but armed also with bows and arrows, they conceal themselves in the brushwood, or among the high and thick her-

the New Continent. See the interesting researches of M. Cuvier, contained in his *Memoire sur les os fossiles des ruminans. Annales du Muséum, An. VI.* p. 353.

bage. By imitating the motion of a stag when it feeds, they draw round them the flock, which becomes the victim of the deception. This extraordinary hunt was seen by M. Costanzo on the coast of the channel of Santa Barbara; and it was seen twenty-four years afterwards in the savannas in the neighbourhood of Monterey* by the officers embarked in the galetas Sutil and Mexicana. The enormous stag-branches which Montezuma displayed as objects of curiosity to the companions of Cortez belonged, perhaps, to the *venados* of New California. I saw two of them, which were found in the old monument of Xoachicalco, still preserved in the palace of the viceroy. Notwithstanding the want of interior communication in the fifteenth century, in the kingdom of Anahuac, it would not have been extraordinary if these stags had come from hand to hand from the 35° to the 20° of latitude, in the same manner as we see the beautiful *piedras de Mahagua* of Brasil among the Caribs, near the mouth of the Orinoco.

The Spanish and Russian establishments being hitherto the only ones which exist on the north-west coast of America, it may not be useless here to enumerate all the missions of New California which have been founded up to 1803. This

* *Viage a Fuca*, p. 164.

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detail is more interesting at this period than ever, as the United States have shown a desire to advance towards the west, towards the shores of the Great Ocean, which, opposite to China, abounds with beautiful furs of sea otters.

The missions of New California run from south to north in the order here indicated:

San Diego, a village founded in 1769, fifteen leagues distant from the most northern mission of Old California. Population in 1802, 1560.

San Luis Rey de Francia, a village founded in 1798, 600.

San Juan Capistrano, a village founded in 1776, 1000.

San Gabriel, a village founded in 1771, 1050.

San Fernando, a village founded in 1797, 600.

San Buenaventura, a village founded in 1782, 950.

Santa Barbara, a village founded in 1786, 1100.

La Purissima Concepcion, a village founded in 1787, 1000.

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San Luis Obisbo, a village founded in 1772, 700.

San Miguel, a village founded in 1797, 600.

Soledad, a village founded in 1791, 570.

San Antonio de Padua, a village founded in 1771, 1050.

San Carlos de Monterey, capital of New California, founded in 1770, at the foot of the Cordillera of Santa Lucia, which is covered with oaks, pines *(foliis ternis)*, and rose bushes. The village is two leagues distant from the presidio of the same name. It appears that the bay of Monterey had already been discovered by *Cabrillo* on the 15th November, 1542, and that he gave it the name of *Bahia de los Pinos*, on account of the beautiful pines with which the neighbouring mountains are covered. It received its present name sixty years afterwards from *Viscaino*, in honour of the viceroy of Mexico, Gaspar de Zunega Count de Monterey, an active man, to whom we are indebted for considerable maritime expeditions, and who engaged Juan de Oñate in the conquest of New Mexico. The coasts in the vicinity of San Carlos produce the famous *aurum meruμ (ormier)* of Monterey, in request by

STATISTICAL ANALYSIS. } XV. *Intendancy of New California.*

the inhabitants of Nootka, and which is employed in the trade of otter skins. The population of San Carlos is 700.

San Juan Bautista, a village founded in 1797, 960.

Santa Cruz, a village founded in 1794, 440.

Santa Clara, a village founded in 1777, 1300.

San Jose, a village founded in 1797, 630.

San Francisco, a village founded in 1776, with a fine port. This port is frequently confounded by geographers with the *port of Drake* further north, under the 38° 10′ of latitude, called by the Spaniards the *Puerto de Bodega*. Population of San Francisco, 820.

We are ignorant of the number of whites, mestizoes and mulattos, who live in New California, either in the *presidios* or in the service of the monks of St. Francis. I believe their number may be about 1300; for in the two years of 1801 and 1802, there were in the cast of *whites* and *mixed* blood 35 marriages, 182 baptisms, and 82 deaths. It is only on this part of the population that the government can reckon for the defence of the coast, in case of any military attack by the maritime powers of Europe!

Recapitulation of the total population of New Spain.

Indigenous, or Indians		2,500,000
Whites or Spaniards { Creoles	1,025,000	1,100,000
Whites or Spaniards { Europeans	70,000	
African Negros		6,100
Casts of mixed blood		1,231,000
	Total.	5,837,100

These numbers are only the result of a calculation by approximation. We have judged it proper to adopt the sum total already mentioned, vol. i. p. 272*.

* The reader will perceive on summing up the above table that the amount is only 4,837,100, consequently there is a million of deficiency somewhere. M. de Humboldt elsewhere states the Indians at two-fifths of the whole population of New Spain, so *they* are not underated here. In the commencement of the 7th chapter the author observes that the whites would occupy the second place, considered only in the relation of number. In the above table, however, they are inferior in number to the casts of mixed blood. In the second paragraph of the 7th chapter the author states the amount of the whites at 1,200,000. We are tempted to think that the two first figures of this number ought to change place with one another,

After this view of the provinces of which the vast empire of Mexico is composed, it remains for us to bestow a rapid glance on the coast of the Great Ocean, which extends from the port of San Francisco, and from Cape Mendocino to the Russian establishments in Prince William's Sound.

The whole of this coast has been visited since the end of the sixteenth century by Spanish navigators; but they have only been carefully examined by order of the viceroys of New Spain since 1774. Numerous expeditions of discovery have followed one another up to 1792. The colony attempted to be established by the Spaniards at Nootka fixed for some time the attention of all the maritime powers of Europe. A few sheds erected on the coast, and a miserable bastion defended by swivel guns, and a few cabbages planted within an enclosure, were very near exciting a bloody war between Spain and England; and it

which would then make 2,100,000. This would give us the additional million wanting in the above table. However, the author adds that nearly a fourth part of the white population of 1,200,000 inhabit the *provincias internas*. Now the whole population of the provincias internas, including whatever Indians or other races there may be in them, amounts only to 423,300. So that deducting the Indians, &c. this number would approach nearer perhaps to a fourth of 1,200,000 than of 2,100,000. Amidst these difficulties the reader must decide for himself. *Trans.*

was only by the destruction of the establishment founded at the island of *Quadra and of Vancouver* that Macuina, the *Tays* or prince of Nootka, was enabled to preserve his independence. Several nations of Europe have frequented these latitudes since 1786, for the sake of the trade in sea otter skins; but their rivalry has had the most disadvantageous consequences both for themselves and the natives of the country. The price of the skins as they rose on the coast of America fell enormously in China. Corruption of manners has increased among the Indians; and by following the same policy by which the African coasts have been laid waste, the Europeans endeavoured to take advantage of the discord among the *Tays*. Several of the most debauched sailors deserted their ships to settle among the natives of the country. At Nootka, as well as at the Sandwich Islands, the most fearful mixture of primitive barbarity with the vices of polished Europe is to be observed. It is difficult to conceive that the few species of roots of the old continent transplanted into these fertile regions by voyagers, which figure in the list of the benefits that the Europeans boast of having bestowed on the inhabitants of the South Sea islands, have proved any thing like a compensation for the real evils which they introduced among them.

At the glorious epoqua in the sixteenth century, when the Spanish nation, favoured by a combina-

tion of singular circumstances, freely displayed the resources of their genius and the force of their character, the problem of a *passage to the north-west*, and a direct road to the East Indies, occupied the minds of the Castilians with the same ardour displayed by some other nations within these thirty or forty years. We do not allude to the apocryphal voyages of *Ferrer Maldonado*, *Juan de Fuca*, and *Bartolome Fonte*, to which for a long time only too much importance was given. The most part of the impostures published under the names of these three navigators were destroyed by the laborious and learned discussions of several officers of the Spanish marine*. In place of bringing forward names nearly fabulous, and losing ourselves in the uncertainty of hypotheses, we shall confine ourselves to indicate here what is incontestibly proved by historical documents. The following notices, partly drawn from the manuscript memoirs of Don Antonio Bonilla and M. Casasola, preserved in the archives of the viceroyalty of Mexico, present facts which, combined together, deserve the attention of the reader. These notices, displaying, as it were, the varying picture of the

* *Memoirs of Don Ciriaco Cevallos. Researches into the Archives of Seville*, by *Don Augustin Ceau. Historical Introduction to the Voyage of Galiano and Valdes*, p. xlix. lvi. and lxxvi. lxxxiii. Notwithstanding all my enquiries, I could never discover in New Spain a single document in which the pilot Fuca or the admiral Fonte were named.

national activity, sometimes excited and sometimes palsied, will even be interesting to those who do not believe that a country inhabited by freemen belongs to the European nation who first saw it.

The names of *Cabrillo* and *Gali* are less celebrated than Fuca and Fonte. The true recital of a modest navigator has neither the charm nor the power which accompany deception. *Juan Rodriguez Cabrillo* visited the coast of New California to the 37° 10′, or the *Punta del Año Nuevo*, to the north of Monterey. He perished (on the 3d January, 1543) at the island of San Bernardo, near the channel of Santa Barbara*. But Bartolome Ferrelo, his pilot, continued his discoveries northwards to the 43° of latitude, when he saw the coast of Cape Blanc, called by Vancouver Cape Orford.

Francisco Gali, in his voyage from Macao to Acapulco, discovered in 1582 the north-west coast of America under the 57° 30′. He admired, like all those who since his time have visited New Cornwall, the beauty of those colossal mountains, of which the summit is covered with perpetual snow, while their bottom is covered with the most beautiful vegetation. On correcting † the old ob-

* According to the manuscript preserved in the *archivo general de Indias* at Madrid.

† These corrections have been already made in this work wherever the latitudes of the old navigators are cited. Viaje de la Sutil, p. xxxi.

servations by the new in places of which the identity is ascertained, we find that Gali coasted part of the archipelago of the Prince of Wales, or that of King George. Sir Francis Drake only went as far as the 48° of latitude to the north of Cape Grenville in New Georgia.

Of the two expeditions undertaken by Sebastian Viscayno in 1596 and 1602, the last only was directed to the coast of New California. Thirty-two maps, drawn up at Mexico by the cosmographer Henry Martinez *, prove that Viscayno surveyed these coasts with more care and more intelligence than was ever done by any pilot before him. The diseases of his crew, the want of provision, and the extreme rigour of the season, prevented him, however, from ascending higher than Cape S. Sebastian, situated under the 42° of latitude, a little to the north of the bay of the Trinity. One vessel of Viscayno's expedition, the frigate commanded by Antonio Florez, alone passed Cape Mendocino. This frigate reached the mouth of a river in the 43° of latitude, which appears to have been already discovered by Cabrillo in 1543, and which was believed by Martin de Aguilar to be the western extremity of the Straits of Anian †.

* The same of whom we have already spoken in the History of the Desague Real de Huehuetoca.

† The Straits of Anian, confounded by many geographers with Bering's Straits, meant in the 16th century Hudson's Straits. It took its name from one of the two brothers em-

We must not confound this entry or river of Aguilar, which could not be found again in our times, with the mouth of the Rio Columbia (latitude 46° 15') celebrated from the voyages of Vancouver, Gray, and Captain Lewis.

The brilliant epoqua of the discoveries made anciently by the Spaniards on the north-west coast of America ended with Gali and Viscayno. The history of the navigations of the 17th century, and the first half of the 18th, offers us no expedition directed from the coast of Mexico to the immense shore from Cape Mendocino to the confines of eastern Asia. In place of the Spanish the Russian flag was alone seen to float in these latitudes, waving on the vessels commanded by two intrepid navigators, Bering and Tschiricow.

At length, after an interruption of nearly 170 years, the court of Madrid again turned its attention to the coast of the Great Ocean. But it was not alone the desire of discoveries useful to science which roused the government from its lethargy. It was rather the fear of being attacked in its most northern possessions of New Spain; it was the dread of seeing European enstablishments in the neighbourhood of those of California. Of all the Spanish expeditions undertaken between 1774 and 1792 the two last alone bear the true

barked on board the vessel of Gaspar de Cortereal. See the learned researches of M. de Fleurieu in the historical introduction to the *Voyage de Marchand*, T. i p. v.

character of expeditions of discovery. They were commanded by officers whose labours display an intimate acquaintance with nautical astronomy. The names of Alexander Malaspina, Galiano, Espinosa, Valdes, and Vernaci, will ever hold an honourable place in the list of the intelligent and intrepid navigators to whom we owe an exact knowledge of the north-west coast of the new continent. If their predecessors could not give the same perfection to their operations, it was because, setting out from San Elas or Monterey, they were unprovided with instruments and the other means furnished by civilized Europe.

The first important expedition made after the voyage of Viscayno was that of *Juan Perez*, who commanded the corvette Santiago, formerly called la Nueva Galicia. As neither Cook nor Barrington, nor M. de Fleurieu, appear to have had any knowledge of this important voyage, I shall here extract several facts from a manuscript journal *, for which I am indebted to the kindness of M. Don Guillermo Aguirre, a member of the audiencia of Mexico. Perez and his pilot, Estevan Jose Martinez, left the port of San Blas on the 24th January, 1774. They were ordered to examine all the

* This journal was kept by two monks, Fray Juan Crespi, and Fray Tomas de la Peña, embarked on board the Santiago. By these details may be completed what was published in the voyage of *la Sutil*, p. xcii.

† The *entrada de Perez* of the Spanish maps.

coast from the port of San Carlos de Monterey to the 60° of latitude. After touching at Monterey they set sail again on the 7th June. They discovered on the 20th July the island de la Marguerite (which is the north-west point of Queen Charlotte's Island), and the strait which separates this island from that of the Prince of Wales. On the 9th August they anchored, *the first of all the European navigators*, in Nootka road, which they called the port of *San Lorenzo*, and which the illustrious Cook four years afterwards called *King George's Sound*. They carried on barter with the natives, among whom they saw iron and copper. They gave them axes and knives for skins and otter furs. Perez could not land on account of the rough weather and high seas. His sloop was even on the point of being lost in attempting to land; and the corvette was obliged to cut its cables and to abandon its anchors to get into the open sea. The Indians stole several articles belonging to M. Perez and his crew; and this circumstance, related in the journal of Father Crespi, may serve to resolve the famous difficulty attending the European silver spoons found there by Captain Cook in 1778 in the possession of the Indians of Nootka. The corvette Santiago returned to Monterey on the 27th August, 1774, after a cruize of eight months.

In the following year a second expedition set out from San Blas, under the command of *Don*

Bruno Heceta, *Don Juan de Ayala*, and *Don Juan de la Bodega y Quadra*. This voyage, which singularly advanced the discovery of the north-west coast, is known from the journal of the pilot Maurelle, published by M. Barrington, and joined to the instructions of the unfortunate Laperouse. Quadra discovered the mouth of the Rio Columbia, called *entrada de Heceta*, the pic of *San Jacinto* (Mount Edgecumbe), near Norfolk Bay, and the fine part of *Bucareli* (latitude 55° 24′), which from the researches of Vancouver we know to belong to the west coast of the great island of the archipelago of the Prince of Wales. This port is surrounded by seven volcanos, of which the summits, covered with perpetual snow, throw up flames and ashes. M. Quadra found there a great number of dogs which the Indians use for hunting. I possess two very curious small maps * engraved in 1788, in the city of Mexico,

* Carta geografica de la costa occidental de la California, situada al Norte de la linea sobre el mar asiatico que se discubriò en los anos de 1769 y 1775, por el Teniente de Navio, Don Juan Francisco de Bodega y Quadra y por el Alferez de Fragata, Don Jose Canizares, desde los 17 hasta los 58 grados. On this map the coast appears almost without *entradas* and without islands. We remark l'ensenada de Ezeta (Rio Colombia) and l'entrada de Juan Perez, but under the name of the port of San Lorenzo (Nootka), seen by the same Perez in 1774. Plan del gran puerto de San Francisco discubierto por Don Jose de Canizares en el mar Asiatico. Vancouver distinguishes the ports of St. Francis, Sir Francis Drake, and

which give the bearings of the coast from the 17° to the 58° of latitude, as they were discovered in the expedition of Quadra.

The court of Madrid gave orders in 1776 to the viceroy of Mexico, to prepare a new expedition to examine the coast of America to the 70° of north latitude. For this purpose two corvettes were built, *la Princessa* and *la Favorita;* but this building experienced such delay, that the expedition commanded by Quadra and Don Ignacio Arteaga, could not set sail from the port of San Blas till the 11th February, 1779. During this interval Cook visited the same coast. Quadra and the pilot Don Francisco Maurelle carefully examined the port de Bucareli, the Mont-Sant Elie, and the island de la Magdalena, called by Vancouver Hinchinbrook Island (latitude 60° 25′), situated at the entry of Prince William's bay, and the island of Regla, one of the most sterile islands in Cook river. The expedition returned to San Blas on the 21st November, 1779. I find from a manuscript procured at Mexico, that the schistous rocks in the vicinity of the port of Bucareli in Prince of Wales's Island contain metalliferous seams.

The memorable war which gave liberty to a

Bodega, as three different ports. M. de Fleurieu considers them as identical. Voyage de Marchand, vol. i. p. liv. Quadra believes, as we have already observed, that Drake anchored at the port de la Bodega.

great part of North America prevented the viceroys of Mexico from pursuing expeditions of discovery to the north of Mendocino. The court of Madrid gave orders to suspend the expeditions so long as the hostilities should endure between Spain and England. This interruption continued even long after the peace of Versailles; and it was not till 1788 that two Spanish vessels, the frigate *la Princesa* and the packet-boat *San Carlos*, commanded by Don Esteban Martinez and Don Gonzalo Lopez de Haro, left the port of San Blas with the design of examining the position and state of the Russian establishments on the north-west coast of America. The existence of these establishments, of which it appears that the court of Madrid had no knowledge till after the publication of the third voyage of the illustrious Cook, gave the greatest uneasiness to the Spanish government. It saw with chagrin that the fur trade drew numerous English, French, and American vessels towards a coast which, before the return of Lieutenant King to London, had been as little frequented by Europeans as the land of the Nuyts, or that of Endracht in New Holland.

The expedition of Martinez and Haro lasted from the 8th March to the 5th December, 1788. These navigators made the direct route from San Blas to the entry of Prince William, called by the Russians the gulf *Tschugatskaja*. They visited Cook river, the *Kichtak* (Kodiak) islands,

Schumagin, *Unimak*, and *Unalaschka* (Onalaska.) They were very friendly treated in the different factories which they found established in Cook river and Unalaschka, and they even received communication of several maps drawn up by the Russians of these latitudes. I found in the archives of the viceroyalty of Mexico a large volume in folio, bearing the title of *Reconocimiento de los quatros establecimientos Russos al Norte de la California, hecho en* 1788. The historical account of the voyage of Martinez contained in this manuscript furnishes, however, very few data relative to the Russian colonies in the new continent. No person in the crew understanding a word of the Russian language, they could only make themselves understood by signs. They forgot, before undertaking this distant expedition, to bring an interpreter from Europe. The evil was without remedy. However M. Martinez would have had as great difficulty in finding a Russian in the whole extent of Spanish America as Sir George Staunton had to discover a Chinese in England or France.

Since the voyages of Cook, Dixon, Portlock, Mears, and Duncan, the Europeans began to consider the port of Nootka as the principal fur market of the north-west coast of North America. This consideration induced the court of Madrid to do in 1789 what it could easier have done 15 years sooner, immediately after the voyage of Juan

Perez. M. *Martinez*, who had been visiting the Russian factories, received orders to make a solid establishment at Nootka, and to examine carefully that part of the coast comprised between the 50° and the 55° of latitude, which Captain Cook could not survey in the course of his navigation.

The port of Nootka is on the eastern coast of an island, which, according to the survey in 1791 by MM. *Espinosa* and *Cevallos*, is twenty marine miles in breadth, and which is separated by the channel of Tasis from the great island, now called the island of Quadra and Vancouver. It is therefore equally false to assert that the port of Nootka, called by the natives *Yucuatl*, belongs to the great island of Quadra, as it is inaccurate to say that Cape Horn is the extremity of Terra del Fuego. We cannot conceive by what misconception the illustrious Cook could convert the name of *Yucuatl* into *Nootka**, this last word being unknown

* There does not seem to be any difficulty in the matter. It is very easy for any one at all acquainted with the embarrassment experienced by the ear in catching, and, as it were, disentangling the sounds of a foreign language, to conceive that when the common standard of writing cannot be resorted to, hardly two persons will report the same word alike. In languages even already familiar to us by writing, it requires a long experience before we can follow the conversation of the natives; what must it therefore be in languages affording no such assistance, and of which many of the sounds are new to European ears. Thus Captain Cook and Mr. Anderson, a surgeon in his expedition, hardly agree in the representation

to the natives of the country, and having no analogy to any of the words of their language excepting *Noutchi*, which signifies mountain.*

of any one word. It would appear, however, from what is said of Captain Cook by Mr. King, that his ear was by no means very accurate in distinguishing sounds. *Trans.*

* Memoire de Don Francisco Moziño. The worthy author was one of the botanists of the expedition of M. Sesse, and remained at Nootka with M. Quadra in 1792. Wishing to procure every possible information with regard to the north-west coast of North America, I made extracts in 1803 from the manuscript of M. Moziño, for which I was indebted to the friendship of professor Cervantes, director of the botanical garden at Mexico. I have since discovered that the same memoir furnished materials to the learned compiler of the *Viage de la Sutil*, p. 123. Notwithstanding the accurate information which we owe to the English and French navigators, it would still be interesting to publish the observations of M. Moziño on the manners of the Indians of Nootka. These observations embrace a great number of curious subjects, viz. the union of the civil and ecclesiastical power in the person of the princes or tays; the struggle between Quautz and Matlox, the good and bad principle by which the world is governed; the origin of the human species at an epoqua when stags were without horns, birds without wings, and dogs without tails; the Eve of the Nootkians, who lived solitary in a flowery grove of Yucuatl, when the god Quautz visited her in a fine copper canoe; the education of the first man, who, as he grew up, past from one small shell to a greater; the genealogy of the nobility of Nootka, who descend from the oldest son of the man brought up in a shell, while the rest of the people (who even in the other world have a separate paradise called *Pinpula*) dare not trace their origin farther back than to younger branches; the calendar of the

Don Esteban Martinez, commanding the frigate La Princessa, and the pacquet boat San Carlos, anchored in the port of Nootka on the 5th May, 1789. He was received in a very friendly manner by the chief Macuina, who recollected very well having seen him with M. Perez in 1774, and who even shewed the beautiful Monterey shells which were then presented to him. Macuina, the *tays* of the island of Yucuatl, has an absolute authority; he is the Montezuma of these countries; and his name has become celebrated among all the nations who carry on the sea-otter skin trade. I know not if Macuina yet lives; but we learned at Mexico in the end of 1803, by letters from Monterey, that more jealous of his independence than the king of the Sandwich Islands, who has declared himself the vassal of England, he was endeavouring to procure fire-arms and powder to protect himself from the insults to which he was frequently exposed by European navigators.

The port of *Santa Cruz* of Nootka (called *Puerto de San Lorenzo* by Perez, and *Friendly-cove* by Cook), is from seven to eight fathoms in depth *. It is almost shut in on the south-east by small islands, on one of which Martinez erected the

Nootkians, in which the year begins with the summer solstice, and is divided into fourteen months of 20 days, and a great number of intercalated days added to the end of several months, &c. &c.

* From nearly $7\frac{1}{2}$ to $8\frac{1}{2}$ fathoms English. *Trans.*

battery of San Miguel. The mountains in the interior of the island appear to be composed of *thonschiefer*, and other primitive rocks. M. Moziño discovered among them seams of copper and sulphuretted lead. He thought he discovered near a lake at about a quarter of a league's distance from the port the effects of volcanic fire in some porous amygdaloid. The climate of Nootka is so mild, that under a more northern latitude than that of Quebec and Paris the smallest streams are not frozen till the month of January. This curious phenomenon confirms the observation of Mackenzie*, who asserts that the north-west coast of the new continent has a much higher temperature than the eastern coasts of America and Asia situated under the same parallels. The inhabitants of Nootka, like those of the northern coast of Norway, are almost strangers to the noise of thunder. Electrical explosions are there exceedingly rare. The hills are covered with pine, oak, cypress, rose bushes, vaccinium, and andromedes. The beauti-

* *Voyage de Mackenzie, traduit par Castera*, vol. III. p. 339. It is even believed by the Indians in the vicinity of the north-west coast that the winters are becoming milder yearly. This mildness of climate appears to be produced by the north-west winds, which pass over a considerable extent of sea. M. Mackenzie, as well as myself, believes, that the change of climate observable throughout all North America cannot be attributed to petty local causes, to the destruction of forests for example.

ful shrub which bears the name of Linneus was only discovered by the gardeners in Vancouver's expedition in higher latitudes. John Mears, and a Spanish officer in particular, Don Pedro Alberoni, succeeded at Nootka in the cultivation of all the European vegetables; but the maize and wheat, however, never yielded ripe grain. A too great luxuriance of vegetation appears to be the cause of this phenomenon. The true humming-bird has been observed in the islands of Quadra and Vancouver. This important fact in the geography of animals must strike those who are ignorant that Mackenzie saw humming-birds at the sources of the River of Peace under the 54° 24′ of north latitude, and that M. Galiano saw them nearly under the same southern parallel in the Straits of Magellan.

Martinez did not carry his researches beyond the 50° of latitude. Two months after his entry into the port of Nootka he saw the arrival of an English vessel, the Argonaut, commanded by James Colnet, known by his observations at the Galapagos islands. Colnet showed the Spanish navigator the orders which he had received from his government to establish a factory at Nootka, to construct a frigate and a cutter, and to prevent every other European nation from interfering with the fur trade *: It was in vain Martinez replied,

* There had been formed in England in 1785 a Nootka com-

that, long before Cook, Juan Perez had anchored on the same coast. The dispute which arose between the commanders of the *Argonaut* and the *Princessa* was on the point of occasioning a rupture between the courts of London and Madrid. Martinez, to establish the priority of his rights, made use of a violent and very illegal measure: he arrested Colnet, and sent him by San Blas to the city of Mexico. The true proprietor of the Nootka country, the Tays Macuina, declared himself prudently for the vanquishing party; but the vice-roy, who deemed it proper to hasten the recall of Martinez, sent out three other armed vessels in the commencement of the year 1790 to the north-west coast of America.

Don Francisco Elisa and *Don Salvador Fidalgo*, the brother of the astronomer who surveyed the coast of South America * from the mouth of the Dragon to Portobello, commanded this new expedition. M. Fidalgo visited Cook Creek and Prince William's Sound, and he completed the examination of that coast, which was only afterwards examined by the intrepid Vancouver. Under the 60° 54′ of latitude, at the northern extremity of Prince William's Sound,

pany, under the name of the King George's Sound Company; and a project was even entertained of forming at Nootka an English colony similar to that of New Holland.

* See my Recueil d'Observations Astronomiques, vol. i. liv. i.

M. Fidalgo was witness of a phenomenon, probably volcanic, of a most extraordinary nature. The Indians conducted him into a plain covered with snow, where he saw great masses of ice and stone thrown up to prodigious heights in the air with a dreadful noise. Don Francisco Elisa remained at Nootka to enlarge and fortify the establishment founded by Martinez in the preceding year. It was not yet known in this part of the world, that by a treaty signed at the Escurial on the 28th Octobea, 1790, Spain had desisted from her pretensions to Nootka and Cox Channel in favour of the court of London. The frigate *Dedalus*, which brought orders to Vancouver to watch over the execution of this treaty, only arrived at the port of Nootka in the month of August, 1792, at an epoqua when Fidalgo was employed in forming a second Spanish establishment to the south-east of the island of Quadra on the continent, at the port of *Nuñez Gaona*, or *Quinicamet*, situated under the 48° 20′ of latitude, at the creek of Juan de Fuca.

The expedition of Captain Elisa was followed by two others, which, for the importance of their astronomical operations, and the excellence of the instruments with which they were provided, may be compared with the expeditions of Cook, La Perouse, and Vancouver. I mean the voyage of the illustrious *Malaspina* in 1791, and that of *Galiano* and *Valdes* in 1792.

The operations of Malaspina and the officers

under him embrace an immense extent of coast from the mouth of the Rio de la Plata to Prince William's Sound. But this able navigator is still more celebrated for his misfortunes than his discoveries. After examining both hemispheres, and escaping all the dangers of the ocean, he had still greater to suffer from his court; and he dragged out six years in a dungeon, the victim of a political intrigue. He obtained his liberty from the French government, and returned to his native country; and he enjoys in solitude on the banks of the Arno the profound impressions which the contemplation of nature and the study of man under so many different climates have left on a mind of great sensibility, tried in the school of adversity.

The labours of Malaspina remain buried in the archives, not because the government dreaded the disclosure of secrets, the concealment of which might be deemed useful, but that the name of this intrepid navigator might be doomed to eternal oblivion. Fortunately, the directors of the *Deposito Hydrografico of Madrid** have communicated to the public the principal results of the astronomical observations of Malaspina's expedition. The charts which have appeared at Madrid since 1799 are founded in a great measure on those important results; but in-

* This *deposito* was established by a royal order on the 6th August, 1797.

stead of the name of the chief, we merely find the names of the corvettes *la Descubierta* and *la Atrevida*, which were commanded by Malaspina.

His expedition *, which set out from Cadiz on the 30th July, 1789, only arrived at the port of Acapulco on the 2d February, 1791. At this period the court of Madrid again turned its attention to a subject which had been under dispute in the beginning of the 17th century, the pretended straits by which Lorenzo Ferrer Maldonado passed in 1588 from the Labrador coast to the Great Ocean. A memoir read by M. Buache at the Academy of Sciences revived the hope of the existence of such a passage; and the corvettes la Descubierta and l'Atrevida received orders to ascend to high latitudes on the north-west coast of America, and to examine all the passages and creeks which interrupt the continuity of the shore between the 53° and 60° of latitude. Malaspina, accompanied by the botanists Haenke and Nee, set sail from Acapulco on the 1st May, 1791. After a navigation of three weeks he reached Cape S. Bartholomew, which had already been ascertained by Quadra in 1775, by Cook in 1778, and in

* *Extract from a journal kept on board the Atrevida*, a manuscript preserved in the archives of Mexico.—*Viage de la Sutil*, p. cxiii.—cxxiii. Before the expedition in 1789, M. Malaspina had already been round the globe in the frigate *l'Astré*, destined for Manilla.

1786 by Dixon. He surveyed the coast, from the mountain of San Jacinto, near Cape Edgecumbe (*Cabo Engano*), lat. 57° 1' 30" to Montagu Island, opposite the entrance of Prince William's Sound. During the course of this expedition, the length of the pendulum and the inclination and declination of the magnetic needle were determined on several points of the coast. The elevation of S. Elie * and Mount Fair-weather (or *Cerro de buen Tempo*), which are the principal summits of the Cordillera of New Norfolk, were very carefully measured. The knowledge of their height and position may be of great assistance to navigators when they are prevented by unfavourable weather from seeing the sun for whole weeks; for by seeing these pics at a distance of eighty or a hundred miles, they may ascertain the position of their vessel by simple elevations and angles of altitude.

After a vain attempt to discover the straits mentioned in the account of the apocryphal voyage of

* The expedition of Malaspina found the height of Mount Elie 5441 metres (6507,6 varas), and the height of Mount Fair-weather 4489 (5368,3 varas); consequently the elevation of the former of these mountains is nearly the same as that of Cotopaxi; and the elevation of the second is equal to that of Mont-Rose.—See vol. i. p. 62, and my *Geographie des Plantes*, p. 153.—*Author.*

The height of the first of these mountains is 17,850, and of the second, 14,992 feet English.—*Trans.*

Maldonado, and after remaining some time at Port Mulgrave, in Behring's Bay (lat. 59° 4′ 20″), Alexander Malaspina directed his course southwards. He anchored at the port of Nootka on the 14th August, sounded the channels round the island of Nuca, and determined by observations purely celestial the positions of Nootka, Monterey and the island of Guadaloupe, at which the galeon of the Philippines (*la Nao de China*) generally stops, and Cape San Lucas. The corvette *la Atrevida* entered Acapulco, and the corvette *la Descubierta* entered San Blas in the month of October, 1791.

A voyage of six months was no doubt by no means sufficient for discovering and surveying an extensive coast with that minute care which we admire in the voyage of Vancouver, which lasted three years. However, the expedition of Malaspina has one particular merit, which consists not only in the number of astronomical observations, but also in the judicious method employed for attaining certain results. The longitude and latitude of four points of the coast, Cape San Lucas, Monterey, Nootka, and Port Mulgrave, were ascertained in an absolute manner. The intermediate points were connected with these fixed points by means of four sea-watches of Arnold. This method, employed by the officers of Malaspina's expedition, MM *Espinosa*, *Cevallos*, and *Fernandez*, is much better than the *partial* corrections usually

made in chronometrical longitudes by the results of lunar distances.

The celebrated Malaspina had scarcely returned to the coast of Mexico, when, discontented with not having seen at a sufficient nearness the extent of coast from the island of Nootka to Cape Mendocino, he engaged Count de Revillagigedo, the viceroy, to prepare a new expedition of discovery towards the north-west coast of America. The viceroy, who was of an active and enterprising disposition, yielded with so much the greater facility to this desire, as new information, received from the officers stationed at Nootka, seemed to give probability to the existence of a channel, of which the discovery was attributed to the Greek pilot, Juan de Fuca, in the end of the 16th century. Martinez had indeed, in 1774, perceived a very broad opening under the 48° 20′ of latitude. This opening was succes ively visited by the pilot of the Gertrudis, by Ensign Don Manuel Quimper, who commanded the Eilander la Princessa Real, and in 1791 by Captain Elisa. They even discovered secure and spacious ports in it. It was to complete this survey that the galeras *Sutil* and *Mexicana* left Acapulco on the 8th March, 1792, under the command of Don Dionisiso Galiano and Don Cayetano Valdes.

These able and experienced astronomers, accompanied by MM. Salamanca and Vernaci,

sailed round the large island which now bears the name of *Quadra* and *Vancouver*, and they employed four months in this laborious and dangerous navigation. After passing the straits of Fuca and Haro, they fell in with, in the channel del Rosario, called by the English the Gulph of Georgia, the English navigators *Vancouver* and *Broughton* employed in the same researches with themselves. The two expeditions made a mutual and unreserved communication of their labours; they assisted one another in their operations; and there subsisted among them till the moment of their separation a good intelligence and complete harmony, of which, at another epoqua, an example had not been set by the astronomers on the ridge of the Cordilleras.

Galiano and Valdes, on their return from Nootka to Monterey, again examined the mouth of the *Ascencion*, which *Don Bruno Eceta* discovered on the 17th Angust, 1775, and which was called the river of Columbia by the celebrated American navigator Gray, from the name of the sloop under his command. This examination was of so much the greater importance, as Vancouver, who had already kept very close to this coast, was unable to perceive any entrance from the 45° of latitude to the channel of Fuca; and as this learned navigator began then to doubt of the existence of the Rio de Colombia *, or the *Entrada de Eceta*.

* I have already spoken (Vol. I. p. 20.) of the facility

In 1797 the Spanish government gave orders that the charts drawn up in the course of the expedition of MM. Galiano and Valdes should be published, "in order that they might be in the hands of the public before those of Vancouver." However the publication did not take place till 1802; and geographers now possess the advantage of being able to compare together the charts of

which the fertile banks of the Colombia affords to Europeans for the founding a colony, and of the doubts started against the identity of this river and the Tacoutche-Tessi, or *Oregan* of Mackenzie. I know not whether this Oregan enters into one of the great salt-water lakes, which, according to the information afforded by Father Escalante, I have represented under the 39° and 41° of latitude. I do not decide whether or not the Oregan, like many great rivers of South America, does not force a passage through a chain of elevated mountains, and whether or not its mouth is to be found in one of the creeks between the port de la Bodega and Cape Orford; but I could have wished that a geographer, in other respects both learned and judicious, had not attempted to recognize the name of Oregan in that of Origen, which he believes to designate a river in the map of Mexico, published by Don Antonio Alzate (*Geographie Mathematique, Physique, et Politique*, vol. xv. p. 116 and 117). He has confounded the Spanish word *Origen*, the source or origin of a thing, with the Indian word *Origan*. The map of Alzate only marks the Rio Colorado, which receives its waters from the Rio Gila. Near the junction we read the following words: Rio Colorado ó del Norte, *cuyo origen se ignora*, of which the origin is unknown. The negligence with which these Spanish words are divided (they have engraved Nortecuio and Seignora) is undoubtedly the cause of this extraordinary mistake.

Vancouver, those of the Spanish navigators published by the *Deposito Hydrografico* of Madrid, and the Russian chart published at Petersburg in 1802, in the depôt of the maps of the charts of the emperor. This comparison is so much the more necessary, as the same capes, the same passages, and the same islands, frequently bear three or four different names; and geographical synonomy has by that means become as confused as the synonomy of cryptogameous plants has become from an analogous cause.

At the same epoqua at which the vessels *Sutil* and *Mexicana* were employed in examining, in the greatest detail, the shore between the parallels of 45° and 51°, the Count de Revillagigedo destined another expedition for higher latitudes. The mouth of the river of *Martin de Aquilar* had been unsuccessfully sought for in the vicinity of Cape Orford and Cape Gregory. Alexander Malaspina, in place of the famous channel de *Maldonado*, had only formed openings without any outlet. Galiano and Valdes had ascertained that the Strait of Fuca was merely an arm of the sea, which separates an island of more than 1700 square leagues *; that of *Quadra and Vancouver* from the mountainous coast of New Georgia.

* The extent of the island of *Quadra and Vancouver*, calculated according to the maps of Vancouver, is 1730 square leagues of 25 to the sexagesimal degree. It is the largest island to be found on this west coast of America.

There still remained doubts as to the existence of the straits, of which the discovery was attributed to admiral *Fuentes* or *Fonte*, which was supposed to be under the 53° of latitude. Cook regretted his want of ability to examine this part of the continent of New Hanover; and the assertions of Captain Colnet, an able navigator, rendered it extremely probable that the continuity of the coast was interrupted in these latitudes. To resolve a problem of such importance, the viceroy of New Spain gave orders to Lieutenant *Don Jacinto Caamaño*, commander of the frigate Aranzazu, to examine with the greatest care the shore from the 51° to the 56° of north latitude. M. Caamaño, whom I had the pleasure of seeing at Mexico, set sail from the port of San Blas on the 20th March, 1792; and he made a voyage of six months. He carefully surveyed the northern part of Queen Charlotte's Island, the southern coast of the Prince of Wales's Island, which he called *Isla de Ulloa*, the islands of Revillagigedo, of Banks (or de la *Calamidad*), and of Aristizabal, and the great inlet of Moñiño, the mouth of which is opposite the archipelago of Pitt. The considerable number of Spanish denominations preserved by Vancouver in his charts proves that the expeditions, of which we have given a summary account, contributed in no small degree to our knowledge of a coast, which, from the 45° of latitude to Cape Douglas to the east of Cook's

Creek, is now more accurately surveyed than the most part of the coasts of Europe.

I have confined myself to the bringing together at the end of this chapter all the information which I could procure with regard to the voyages undertaken by the Spaniards, from 1553 to our own times, towards the western coast of New Spain to the north of New California. The assemblage of these materials appeared to me to be necessary in a work embracing whatever concerns the political and commercial relations of Mexico.

The geographers who are eager to divide the world for the sake of facilitating the study of their science distinguish on the north-west coast an English part, a Spanish part, and a Russian part. These divisions have been made without consulting the chiefs of the different tribes who inhabit these countries! If the puerile ceremonies which the Europeans call taking possession, and if astronomical observations made on a recently discovered coast could give rights of property, this portion of the new continent would be singularly pieced out and divided among the Spaniards, English, Russians, French, and Americans. One small island would sometimes be shared by two or three nations at once, because each might have discovered a different cape of it. The great sinuosity of the coast between the parallels of 55° and 60° embrace the successive discoveries of Gali, Bering, and

Tschirekow, Quadra, Cook, La Perouse, Malaspina, and Vancouver!

No European nation has yet formed a solid establi hment on the immense extent of coast from Cape Mendocino to the 59° of latitude. Beyond this limit the Russian factories commence, the most part of which are scattered and distant from one another, like the factories established by European nations for these last three hundred years on the coast of Africa. The most part of these small Russian colonies have no communication with one another but by sea; and the new denominations of *Russian America*, or *Russian possessions in the new continent*, ought not to induce us to believe that the coast of the *basin of Bering*, the peninsula *Alaska*, or the country of the Tschugatschi, have become Russian *provinces*, in the sense which we give to this word speaking of the Spanish provinces of Sonora or New Biscay.

The western coast of America affords the only example of a shore of 1900 leagues in length, inhabited by one European nation. The Spaniards, as we have already indicated in the commencement of this work*, have formed establishments from fort Maullin in Chili to S. Francis in New California. To the north of the parallel of 38° succeed independent Indian tribes. It is probable

* See vol. i. p. 6.

that these tribes will be gradually subdued by the Russian colonists, who, towards the end of the last century, passed over from the eastern extremity of Asia to the continent of America. The progress of these Russian Siberians towards the south ought naturally to be more rapid than that of the Spanish Mexicans towards the north. A people of hunters, accustomed to live in a foggy, and excessively cold, climate, find the temperature of the coast of New Cornwall very agreeable; but this coast appears an uninhabitable country, a polar region to colonists from a temperate climate, from the fertile and delicious plains of Sonora and New California.

The Spanish government since 1788 has begun to testify uneasiness at the appearance of the Russians on the north-west coast of the new continent. Considering every European nation in the light of a dangerous neighbour, they examined the situation of the Russian factories. The fear ceased on its being known at Madrid that these factories did not extend eastwards beyond Cook's Inlet. When the emperor Paul, in 1799, declared war against Spain, it was some time in agitation at Mexico to prepare a maritime expedition in the ports of San Blas and Monterey against the Russian colonies in America. If this project had been carried into execution we should have seen at hostilities two nations who, occupying the opposite extremities of Europe, approach each other

in the other hemisphere on the eastern and western limits of their vast empires.

The interval which separates these limits becomes progressively smaller; and it is for the political interest of New Spain to know accurately the parallel to which the Russian nation has already advanced towards the east and south. A manuscript which exists in the archives of the viceroyalty of Mexico, already cited by me, gave me only vague and incomplete notions. It describes the state of the Russian establishments as they were twenty years ago. M. Malte Brun, in his universal geography, gives an interesting article on the north-west coast of America. He was the first who made known the account of the voyage of Billings*, published by M. *Sarytschew*, which is preferable to that of M. *Sauer*. I flatter myself that I am able to give from very recent data, drawn from an official production†, the position

* *Account of the geographical and astronomical expedition, undertaken for exploring the coast of the Icy Sea, the land of the Tshutski, and the islands between Asia and America, under the command of Captain Billings, between the years* 1785 *and* 1794, *by Martin Sauer, secretary to the expedition. Putetchestwie flota-kapitana Sarytscheva po severowostochnoi tschasti sibiri, ledowitawa mora, i wostochnogo okeana,* 1804.

† *Carte des découvertes faites successivement par des navigateurs Russes dans l'Ocean Pacifique, et dans la mer glaciale, corrigée d'apres les observations astronomiques les plus recentes de plusieurs navigateurs etrangers, gravée au depôt des Cartes de sa Majesté l'Empereur de toutes les Russies, en* 1802. This beauti-

of the Russian factories, which are merely collections of sheds and huts, that serve, however, as emporiums for the fur trade.

On the coast nearest to Asia, along Bering's Straits, between the 67° and 64° 10′ of latitude, under the parallels of Lapland and Iceland, we find a great number of huts frequented by the Siberian hunters. The principal posts, reckoning from north to south, are, *Kigiltach*, *Leglelachtok*, *Tuguten*, *Netschich*, *Tchinegriun*, *Chibalech*, *Topar*, *Pintepata*, *Agulichan*, *Chavani*, and *Nugran*, near *Cape Rodney* (Cap du Parent). These habitations of the natives of Russian America are only from thirty to forty leagues distant* from

ful chart, for which I am indebted to the kindness of *M. de St. Aignan*, is 1^{m},231 (4.037 feet) in length, and 0^{m}, 722 (2.367 feet) in breadth, and embraces the extent of coast and sea between the 40° and 72° of latitude, and the 125° and 224° of west longitude from Paris. The names are in Russian characters.

* As it is more than probable that Asiatic and American tribes have crossed the ocean, it may be curious to examine the breadth of the arm of the sea which separates the two continents under the 65° 50′ of north latitude. According to the most recent discoveries by the Russian navigators, America is nearest to Siberia on a line which crosses Bering's Straits in a direction from the south-east to the north-west, from *Prince of Wales's Cape* to Cape *Tsckoukotskoy*. The distance between these two capes is 44′, or $18\frac{3}{75}$ leagues of 25 to the degree. The island of Imaglin is almost in the middle of the channel, being one-fifth nearer the Asiatic cape. However, it is not

the huts of the Tchoutskis of *Asiatic Russia*. The Straits of Bering, which separates them, is filled with desert islands, of which the most northern is called Imaglin. The north-east extremity of Asia forms a peninsula, which is only connected

necessary for our conceiving that Asiatic tribes established on the table-land of Chinese Tartary should pass from the old to the new continent, to have recourse to a transmigration at such high latitudes. A chain of small islands in the vicinity of one another stretches from Corea and Japan to the southern cape of the peninsula of Kamtschatka, between the 33° and the 51° of latitude. The great island of Tchoka, connected with the continent by an immense sand-bank (under the 52° of latitude), facilitates communication between the mouths of l'Amour and the Kurile Islands. Another archipelago of islands, by which the great basin of Bering is terminated on the south, advances from the peninsula of Alaska 400 leagues towards the west. The most western of the Aleutian Islands is only 144 leagues distant from the eastern coast of Kamtschatka, and this distance is also divided into two nearly equal parts, the Bering and Mednoi islands, situated under the 55° of latitude. This rapid view sufficiently proves that Asiatic tribes might have gone by means of these islands from one continent to the other *without going higher on the continent of Asia than the parallel of* 55°, without turning the sea of Ochotsk to the west, and without a passage of more than twenty-four or thirty-six hours. The north west winds, which, during a great part of the year blow in these latitudes, favour the navigation from Asia to America between the 50° and 60° of latitude. It is not wished in this note to establish new historical hypotheses, or to discuss those which have been hackneyed these forty years: we merely wish to afford exact notions as to the proximity of the two continents.

with the great mass of the continent by a narrow isthmus between the two gulfs Mitschigmen and Kaltschin. The Asiatic coast which borders the Straits of Bering is peopled by great numbers of cetaceous mammiferi. On this coast the Tchoutskis, who live in perpetual war with the Americans, have collected together their habitations. Their small villages are called *Nukan*, *Tugulan*, and *Tschigin*.

Following the coast of the continent of America from Cape Rodney and Norton Creek to Cape Malowodan, *Cape Littlewater*, we find no Russian establishment; but the natives have a great number of huts collected together on the shore between the 63° 20′ and 60° 5′ of latitude. The most northern of their habitations are *Agibaniach* and *Chalmiagmi*, and the most southern *Kuynegach* and *Kuymin*.

The bay of Bristol, to the north of the peninsula Alaska (or Aliaska) is called by the Russians the *gulf Kamischezkaia*. They in general preserve none of the English names given by Captain Cook, and Captain Vancouver, in their charts, to the north of the 55° of latitude. They choose rather to give no names to the two great islands which contain the Pic *Trubizin* (the Mount Edgecumbe of Vancouver, and Cerro de San Jacinto of Quadra), and Cape *Tschirikof* (Cape San Bartholomé), than adopt the denominations of *King*

George's Archipelago, and *Prince of Wales's Archipelago*.

The coast from the gulph Kamischezkaia to New Cornwall is inhabited by five tribes, who form as many great territorial divisions on the colonies of Russian America. Their names are *Koniagi*, *Kenayzi*, *Tschugatschi*, *Ugalachmiuti*, and *Koliugi*.

The most northern part of Alaska, and the island of Kodiak, vulgarly called by the Russians *Kichtak*, though *Kightak* in the language of the natives in general means only an island, belongs to the *Koniagi* division. A great interior lake of more than 26 leagues in length, and 12 in breadth, communicates by the river Igtschiagick with the bay of Bristol. There are two forts and several factories on the Kodiak Island (Kadiak), and the small adjacent islands. The forts established by Schelikoff bear the name of *Karluk* and *the three Sanctifiers*. M. Malte-Brun says that, according to the latest information, the Kichtak archipelago was destined to contain the head place of all the Russian settlements. Sarytschew asserts, that there are a bishop and Russian monastery in the island of Umanak (Umnak). I do not know whether there has been any similar establishment elsewhere; for the chart published in 1802 indicates no factory either at Umnak, Unimak, or Unalaschka. I read, however, at Mexico, in the

manuscript journal of Martinez's voyage, that the Spaniards found several Russian houses, and about a hundred small barks, at the island of Unalaschka in 1788. The natives of the peninsula Alaska call themselves the *men of the east*. (Kagataya-Koung'ns).

The *Kenayzi* inhabit the western coast of Cook creek, or the gulph Kenayskia. The *Rada* factory, visited by Vancouver, is situated there under the 61° 8′. The governor of the island of Kodiak, a Greek named Ivanitsch Delareff, assured M. Sauer, that, notwithstanding the rigour of the climate, grain would thrive well on the banks of Cook river. He introduced the cultivation of cabbages and potatoes into the gardens at Kodiak.

The *Tschugatschi* occupy the country between the northern extremity of Cook Inlet and the east of Prince William's bay (Tschugatskaia gulf.) There are several factories and three small forts in this district: Fort Alexander, near the mouth of Port Chatham, and the forts of the Tuk islands, (Green Island of Vancouver), and Tchalca (Hinchinbrook Island).

The *Ugalachmiuti* extend from the gulf of Prince William to the bay of *Jakutat*, called by Vancouver Bering's bay*. The factory of St.

* We must not confound the bay of Bering of Vancouver, situated at the foot of Mount St. Elie, with the Bering's bay of the Spanish maps, near Mount Fairweather (Nevado de Buen-

Simon is near Cape Suckling, (Cape Elie of the Russians.) It appears that the central chain of the Cordilleras of New Norfolk is considerably distant from the coast at the Fic of St. Elie; for the natives informed M. Barrow, who ascended the river Mednaja (copper river) for a length of 500 *werst* (120 leagues), that it would require two days' journey northwards to reach the high chain of the mountains.

The *Koliugi* inhabit the mountainous country of New Norfolk, and the northern part of New Cornwall. The Russians mark Burroughbay on their charts (latitude 55° 50') opposite the Revillagigedo island of Vancouver (Isla de Gravina of the Spanish maps), as the most southern and eastern boundaries of the extent of country of which they claim the property. It appears that the great island of the King George archipelago has, in fact, been examined with more care and more minutely by the Russian navigators than by Vancouver. Of this we may easily convince ourselves by comparing attentively the western coast of this island, especially the environs of Cape Trubizin (Cape Edgecumbe), and of the port of the Archangel St. Michel, in Sitka bay (the Norfolk Sound

tiempo). Without an accurate acquaintance with geographical synonomy, the Spanish, English, Russian and French works on the north-west coast of America are almost unintelligible, and it is only by a minute comparison of the maps that this synonomy can be fixed.

of the English, and Tchinkitané bay of Marchand), on the charts published at Petersbourg in the imperial depôt in 1802, and on the charts of Vancouver. The most southern Russian establishment of this district of the Koliugi is a small fortress (crapost) in the bay of Jakutal, at the foot of the Cordillera which connects Mount Fairweather with Mont St. Elie, near Port Mulgrave, under the 59° 27′ of latitude. The proximity of mountains covered with eternal snow, and the great breadth of the continent from the 58° of latitude, render the climate of this coast of New Norfolk, and the country of the Ugalachmiuti, excessively cold and inimical to the progress of vegetation.

When the sloops of the expedition of Malaspina penetrated into the interior of the bay of Jakutal as far as the port of Desengano, they found the northern extremity of the port under the 59° 59° of latitude covered in the month of July with a solid mass of ice. We might be inclined to believe that this mass belonged to a glacier* which terminated in high maritime alps; but Mackenzie relates, that on examining the banks of the Slave lake, 250 leagues to the east under 61° of latitude, he found the lake wholly frozen over in the month of June. The difference of temperature

* Vancouver, t. v. p. 67.

observable in general on the eastern and western coast of the new continent, of which we have already spoken, appears only to be very sensible to the south of the parallel of 53°, which passes through New Hanover, and the great island of Queen Charlotte.

There is nearly the same *absolute* distance from Petersbourg to the most eastern Russian factory on the continent of America, as from Madrid to the port of San Francisco in New California. The breadth of the Russian empire embraces under the 60° of latitude an extent of country of nearly 2400 leagues; but the small fort of the bay of Jakutal is still more than 600 leagues distant from the most northern limits of the Mexican possessions. The natives of these northern regions have, for a long time, been cruelly harassed by the Siberian hunters. Women and children were retained as hostages in the Russian factories. The instructions given by the Empress Catharine to Captain Billings, drawn up by the illustrious Pallas, breathe the spirit of philanthropy, and the most noble sensibility. The present government is seriously occupied in diminishing the abuses, and repressing the vexations; but it is difficult to prevent these evils at the extremities of a vast empire; and the American is doomed to feel every instant his distance from the capital. Moreover, it appears more than probable that

before the Russians shall clear the interval which separates them from the Spaniards some other enterprizing power will attempt to establish colonies either on the coast of New Georgia, or on the fertile islands in its vicinity.

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BOOK IV.

STATE OF THE AGRICULTURE OF NEW SPAIN. METALLIC MINES.

CHAPTER IX.

Vegetable productions of the Mexican territory.—Progress of the cultivation of the soil.—Influence of the mines on cultivation.—Plants which contribute to the nourishment of man.

We have run over the immense extent of territory comprehended under the denomination of New Spain. We have rapidly described the limits of each province, the physical aspect of the country, its temperature, its natural fertility, and the progress of a nascent population. It is now time to enter more minutely into the state of agriculture and territorial wealth of Mexico.

An empire extending from the sixteenth to the thirty-seventh degree of latitude affords us from its geometrical position, all the modifications of climate to be found on transporting ourselves from the banks of the Senegal to Spain, or from the Malabar coast to the steppes of the great

Bucharia. This variety of climate is also augmented by the geological constitution of the country, by the mass and extraordinary form of the Mexican mountains, which we have described in the third chapter. On the ridge and declivity of the Cordilleras the temperature of each table-land varies as it is more or less elevated; not merely insulated peaks, of which the summits approach the region of perpetual snow, are covered with oaks and pines, but whole provinces spontaneously produce alpine plants; and the cultivator inhabiting the torrid zone frequently loses the hopes of his harvest from the effects of frost or the abundance of snow.

Such is the admirable distribution of heat on the globe, that in the aerial ocean we meet with colder strata in proportion as we ascend, while in the depth of the sea the temperature diminishes as we leave the surface of the water. In the two elements the same latitude unites, as it were, every climate. At unequal distances from the surface of the ocean, but in the same vertical plane, we find strata of air and strata of water of the same temperature. Hence, under the tropics, on the declivity of the Cordilleras, and in the abyss of the ocean, the plants of Lapland, as well as the marine animals in the vicinity of the pole, find the degree of heat necessary to their organic development.

From this order of things, established by nature,

we may conceive that, in a mountainous and extensive country like Mexico, the variety of indigenous productions must be immense, and that there hardly exists a plant in the rest of the globe which is not capable of being cultivated in some part of New Spain. Notwithstanding the laborious researches of three distinguished botanists, MM. Sesse, Mociño, and Cervantes, employed by the court in examining the vegetable riches of Mexico, we are far from yet being able to flatter ourselves that we know any thing like all the plants scattered over the insulated summits, or crowded together in the vast forests at the foot of the Cordilleras. If we still daily discover new herbaceous species on the central table-land, and even in the vicinity of the city of Mexico, how many arborescent plants have never yet been discovered by botanists in the humid and warm region along the eastern coast, from the province of Tabasco, and the fertile banks of the Guasacualco, to Colipa and Papantla, and along the western coast from the port of San Blas and Sonora to the plains of the province of Oaxaca? Hitherto no species of *quinquina* (cinchona), none even of the small groupe, of which the stamina are longer than the corolla, which form the genus exostema, has been discovered in the equinoxial part of New Spain. It is probable, however, that this precious discovery will one day be made on the declivity of the Cordilleras, where arborescent

ferns abound, and where the region * of the true febrifuge quinquina with very short stamina and downy corollæ commences.

We do not propose here to describe the innumerable variety of vegetables with which nature has enriched the vast extent of New Spain, and of which the useful properties will become better known when civilization shall have made farther

* See my *Geographie des Plantes*, p. 61-66, and a memoir published by me in German, containing physical observations on the different species of cinchona growing in the two continents, (*Memoires de la Societé d'Histoire Naturelle de Berlin*, 1807, No. 1 and 2.) It is believed at Mexico, that the portlandia Mexicana, discovered by M. Sesse, might serve as a substitute for the quinquina of Loxa, as is done in a certain degree by the portlandia hexandra (Coutarea Aublet) at Cayenne, the Bonplandia trifoliata Willd. or the cusparé on the banks of the Orinoco, and the switenia febrifuga Roxb. in the East Indies. It is to be desired that the medicinal virtues of the Pinkneya pubens of Michaux (mussaenda bracteolata Bartram) which grows in Georgia, and which has so much analogy with the cinchona, should also be examined. When we consider the properties of the Portlandia, Coutarea, and Bonplandia genera, or the natural affinity between the true prickly and creeping cinchona discovered at Guayaquil by M. Tafalla, and the pederia and danais genera, we perceive that the febrifuge principle of the quinquina is to be found in many other rubiaceous plants. In the same manner the caoutchouc is not only extracted from the hevea, but also from the urceola elastica, from the commiphora Madagascarensis, and from a great number of other plants of the euphorbean, of the urtican (ficus cecropia) of the cucurbitaceous (carica), and of the campanulaceous (lobelia) families.

progress in the country. We mean merely to speak of the different kinds of cultivation which an enlightened government might introduce with success; and we shall confine ourselves to an examination of the indigenous productions which at this moment furnish objects of exportation, and which form the principal basis of the Mexican agriculture.

Under the tropics, especially in the West Indies, which have become the centre of the commercial activity of the Europeans, the word agriculture is understood in a very different sense from what it receives in Europe. When we hear at Jamaica or Cuba of the flourishing state of agriculture, this expression does not offer to the imagination the idea of harvests which serve for the nourishment of man, but of ground which produces objects of commercial exchange, and rude materials for manufacturing industry. Moreover, whatever be the riches or fertility of the country, the valley de los Guines, for example, to the south-east of the Havanah, one of the most delicious situations of the new world, we see only plains carefully planted with sugar-cane and coffee; and these plains are watered with the sweat of African slaves! Rural life loses its charms when it is inseparable from the aspect of the sufferings of our species.

But in the interior of Mexico, the word agriculture suggests ideas of a less afflicting nature. The Indian cultivator is poor, but he is free. His

state is even greatly preferable to that of the peasantry in a great part of the north of Europe. There are neither corvées nor villanage in New Spain; and the number of slaves is next to nothing. Sugar is chiefly the produce of free hands. There the principal objects of agriculture are not the productions to which European luxury has assigned a variable and arbitrary valu , but cereal gramina, nutritive roots, and the agave, the vine of the Indians. The appearance of the country proclaims to the traveller that the soil nourishes him who cultivates it, and that the true prosperity of the Mexican people neither depends on the accidents of foreign commerce, nor on the unruly politics of Europe.

Those who only know the interior of the Spanish colonies from the vague and uncertain notions hitherto published will have some difficulty in believing that the principal sources of the Mexican riches are by no means the mines, but an agriculture which has been gradually ameliorating since the end of the last century. Without reflecting on the immense extent of the country, and especially the great number of provinces which appear totally destitute of precious metals, we generally imagine that all the activity of the Mexican population is directed to the working of mines. Because agriculture has made a very considerable progress in the *capitania general* of Caraccas, in the kingdom of Guatimala, the island of Cuba,

and wherever the mountains are accounted poor in mineral productions, it has been inferred that it is to the working of the mines that we are to attribute the small care bestowed on the cultivation of the soil in other parts of the Spanish colonies. This reasoning is just when applied to small portions of territory. No doubt, in the provinces of Choco and Antioquia, and the coast of Barbacoas, the inhabitants are fonder of seeking for the gold washed down in the brooks and ravins than of cultivating a virgin and fertile soil; and in the beginning of the conquest, the Spaniards who abandoned the peninsula or Canary Islands to settle in Peru and Mexico had no other view but the discovery of the precious metals. "Auri rabida sitis a cultura Hispanos divertit," says a writer of those times, Pedro Martyr*, in his work on the discovery of Yucatan and the colonization of the Antilles. But this reasoning cannot now explain why in countries of three or four times the extent of France agriculture is in a state of languor. The same physical and moral causes which fetter the progress of national industry in the Spanish colonies have been inimical to a better cultiva ion of the soil. It cannot be dou'ted that under improved social institutions the countries which most abound with mineral production, will

* De insulis nuper repertis et de moribus incolarum earum. *Grynæi novus orbis*, 1555, p. 511.

be as well if not better cultivated than those in which no such productions are to be found. But the desire natural to man of simplifying the causes of every thing has introduced into works of political economy a species of reasoning which is perpetuated, because it flatters the mental indolence of the multitude. The depopulation of Spanish America, the state of neglect in which the most fertile lands are found, and the want of manufacturing industry, are attributed to the metallic wealth, to the abundance of gold and silver; as, according to the same logic, all the evils of Spain are to be attributed to the discovery of America, or the wandering race of the merinos, or the religious intolerance of the clergy* !

We do not observe that agriculture is more neglected in Peru than in the province of Cumana or Guayana, in which, however, there are no

* If all the evils of Spain are not to be attributed to the discovery of America, it has been proved by an acute political economist, M. Brougham, that Spain is one of the European nations the state of which is least adapted for colonization, and in which the national capital and industry could in almost no way be more unprofitably employed. It is no less true that the merinos are a great obstacle to agricultural improvement, and that the intolerance of the clergy can contribute very little to the prosperity of the country. The author does not surely mean to say that they are not among the principal causes of the present state of Spain. That there are other causes in abundance every one at all acquainted with that country will have no difficulty in comprehending. *Trans.*

mines worked. In Mexico the best cultivated fields, those which recall to the mind of the traveller the beautiful plains of France, are those which extend from Salamanca towards Silao, Guanaxuato, and the Villa de Leon, and which surround the richest mines of the known world. Wherever metallic seams have been discovered in the most uncultivated parts of the Cordilleras, on the insulated and desert table-lands, the working of mines, far from impeding the cultivation of the soil, has been singularly favourable to it. Travelling along the ridge of the Andes, or the mountainous part of Mexico, we every where see the most striking examples of the beneficial influence of the mines on agriculture. Were it not for the establishments formed for the working of the mines, how many places would have remained desert? how many districts uncultivated in the four intendancies of Guanaxuato, Zacatecas, San Luis Potosi, and Durango, between the parallels of 21° and 25° where the most considerable metallic wealth of New Spain is to be found? If the town is placed on the arid side or the crest of the Cordilleras, the new colonists can only draw from a distance the means of their subsistence and the maintenance of the great number of cattle employed in drawing off the water, and raising and amalgamating the mineral produce. Want soon awakens industry. The soil begins to be cultivated in the ravins and declivities of the neigh-

bouring mountains wherever the rock is covered with earth. Farms are established in the neighbourhood of the mine. The high price of provision, from the competition of the purchasers, indemnifies the cultivator for the privations to which he is exposed from the hard life of the mountains. Thus from the hope of gain alone, and the motives of mutual interest, which are the most powerful bonds of society, and without any interference on the part of the government in colonization, a mine which at first appeared insulated in the midst of wild and desert mountains, becomes in a short time connected with the lands which have long been under cultivation.

Moreover, this influence of the mines on the progressive cultivation of the country is more durable than they are themselves. When the seams are exhausted, and the subterraneous operations are abandoned, the population of the canton undoubtedly diminishes, because the miners emigrate elsewhere; but the colonist is retained by his attachment for the spot where he received his birth, and which his fathers cultivated with their hands. The more lonely the cottage is, the more it has charms for the inhabitant of the mountains. It is with the beginning of civilization as with its decline: man appears to repent of the constraint which he has imposed on himself by entering into society; and he loves solitude because it restores to him his former freedom. This moral tendency,

this desire for solitude, is particularly manifested by the copper-coloured indigenous, whom a long and sad experience has disgusted with social life, and more especially with the neighbourhood of the whites. Like the Arcadians, the Aztec people love to inhabit the summits and brows of the steepest mountains. This peculiar trait in their disposition contributes very much to extend population in the mountainous regions of Mexico. What a pleasure it is for the traveller to follow these peaceful conquests of agriculture, and to contemplate the numerous Indian cottages dispersed in the wildest ravins and necks of cultivated ground advancing into a desert country between naked and arid rocks!

The plants cultivated in these elevated and solitary regions differ essentially from those cultivated on the plains below, on the declivity and at the foot of the Cordilleras. I could treat of the agriculture of New Spain, following the great divisions which I have already laid down in sketching the physical view of the Mexican territory; and I could follow the lines of cultivation traced on my geological sections, of which the elevations have partly been indicated in the third chapter*; but it is to be observed that these lines of cultivation, like that of the perpetual snows to which they are parallel, sink towards the north, and that

* See vol. I. p. 63.

the same cerealia, which only vegetate abundantly under the latitude of Oaxaca and Mexico at a height of fifteen or sixteen hundred metres, are to be found in the *provincias internas* under the temperate zone in plains of inferior elevation. The height requisite for the different kinds of cultivation depends, in general, on the latitude of the places; but such is the flexibility of organization in cultivated plants, that with the assistance of the care of man they frequently break through the limits assigned to them by the naturalist.

Under the equator, the meteorological phenomena, such as those of the geography of plants and animals, are subject to laws which are immutable and easily to be perceived. The climate there is only modified by the height of the place, and the temperature is nearly constant, notwithstanding the difference of seasons. As we leave the equator, especially between the 15th degree and the tropic, the climate depends on a great number of local circumstances, and varies at the same absolute height, and under the same geographical latitude. This influence of localities, of which the study is of such importance to the cultivator, is still much more manifest in the northern than in the southern hemisphere. The great breadth of the new continent, the proximity of Canada, the winds which blow from the north, and other causes already developed, give the equinoxial region of Mexico and the island of Cuba a particular cha-

ràcter. One would say that in these regions the temperate zone, the zone of variable climates, increases towards the south and passes the tropic of Cancer. It is sufficient here to state that in the environs of the Havanah (latitude 23° 8′) the thermometer has been seen to descend to the freezing point at the small elevation of 80 metres* above the level of the ocean †, and that snow has fallen near Valladolid (latitude 19° 42′) at an absolute elevation of 1900 metres ‡, while under the equator this last phenomenon is only observable at the double of the elevation.

These considerations prove to us that towards the tropic, where the torrid zone approaches the temperate zone (I use these improper names from their being consecrated by custom), the plants under cultivation are not subject to fixed and invariable heights. We might be led to distribute

* 262 feet. *Trans.*

† M. Robredo has seen ice formed in a wooden trough in the month of January at the village of Ubajos, fifteen miles south-west from the Havanah, at an absolute elevation of 74 metres (242 feet). I myself saw, at Rio Blanco, the centigrade thermometer on the 4th January, 1801, at eight o'clock in the morning, at 7°, 5′ above zero (45°, 5 of Fahrenheit). During the night an unfortunate negro perished of cold in a prison. However, the mean temperatures of the months of December and January in the plains of the island of Cuba are 17° and 18° (62° and 64° of Fahrenheit). All these determinations were made with excellent thermometers of Nairne.

‡ 6232 feet. *Trans.*

them according to the mean temperature of the places in which they vegetate. We observe, in fact, that in Europe the minimum of the mean temperature which a proper cultivation requires is for the sugar-cane, from 19° to 20°; for coffee 18°; for the orange 17°; for the olive 13°,5′ to 14°; and for the vine yielding wine fit to be drunk from 10° to 11° of the centigrade thermometer*. This thermometrical agricultural scale is accurate enough when we embrace the phenomena in their greatest generality. But numerous exceptions occur when we consider countries of which the mean annual heat is the same, while the mean temperatures of the months differ very much from one another. It is the unequal division of the heat among the different seasons of the year which has the greatest influence on the kind of cultivation proper to such or such a latitude, as has been very well proved by M. Decandole †. Several annual plants, especially gramina with farinaceous seed, are very little affected by the rigour of winter, but, like fruit trees and the vine, require a considerable heat during summer. In part of Maryland, and especially Virginia, the mean temperature of the year is equal and perhaps even superior to that of Lombardy; yet the severity of winter will not allow

* From 60° to 68°; 64°; 62°; from 56°.3 to 57°; and from 50° to 51°.8 of Fahrenheit. *Trans.*

† Flore françoise, troisieme edition, t. II. p. x.

the same vegetables to be there cultivated with which the plains of the Milanese are adorned. In the equinoxial region of Peru or Mexico, rye and especially wheat attain to no maturity in plains of 3500 or 4000 metres of elevation*, though the mean heat of these alpine regions exceeds that of the parts of Norway and Siberia, in which cerealia are successfully cultivated. But for about 30 days the obliquity of the sphere and the short duration of the nights render the summer heats very considerable in the countries in the vicinity of the pole †; while under the tropics or the table-land of the Cordilleras the thermometer never remains a whole day above ten or twelve centigrade degrees.

To avoid mixing ideas of a theoretical nature and hardly susceptible of rigorous accuracy with facts, the certainty of which has been ascertained, we shall neither divide the cultivated plants in New Spain according to the height of the soil in which they vegetate most abundantly, nor according to the degrees of mean temperature which they appear to require for their developement: but we shall arrange them in the order of their utility to society. We shall begin with the vegetables

* 11,482 and 13,123 feet. *Trans.*

† At Umea in Westro-Botnia (latitude 63° 49′) the extremes of the centigrade thermometer were, in 1801, in summer + 35°, in winter — 45°,7. M. Acerbi complains much of the great summer heats in the most northern part of Lapland.

which form the principal support of the Mexican people; we shall afterwards treat of the cultivation of the plants which afford materials to manufacturing industry; and we shall conclude with a description of the vegetable productions which are the subject of an important commerce with the mother-country.

The *banana* is for all the inhabitants of the torrid zone what the cereal gramina, wheat, barley, and rye, are for Western Asia and for Europe, and what the numerous varieties of rice are for the countries beyond the Indus, especially for Bengal and China. In the two continents, in the islands throughout the immense extent of the equinoxial seas, wherever the mean heat of the year exceeds twenty-four centigrade degrees*, the fruit of the banana is one of the most interesting objects of cultivation for the subsistence of man. The celebrated traveller George Forster, and other naturalists after him, pretended that this valuable plant did not exist in America before the arrival of the Spaniards, but that it was imported from the Canary Islands in the beginning of the 16th century. In fact, Oviedo, who, in his Natural History of the Indies, very carefully distinguishes the indigenous vegetables from those which were introduced there, positively says that the first bananas were planted in 1516 in the island of

* 75° of Fahrenheit. *Trans.*

St. Domingo, by Thomas de Berlangas, a monk of the order of preaching friars*. He affirms that he himself saw the musa cultivated in Spain, near the town of Armeria in Grenada, and in the convent of Franciscans at the island of *la Gran Canaria*, where Berlangas procured suckers, which were transported to Hispaniola, and from thence successively to the other islands and to the continent. In support of M. Forster's opinion it may also be stated, that in the first accounts of the voyages of Columbus, Alonzo Negro, Penzon, Vespucci †, and Cortes, there is frequent mention of maize, the papayer, the jatropha manihot, and the agave, but never of the banana. However, the silence of these first travellers only proves the little attention which they paid to the natural productions of the American soil. Hernandez, who, besides medical plants, describes a great number of other Mexican vegetables, makes no mention of the musa. Now this botanist lived half a century after Oviedo, and those who consider the musa as foreign to the new continent cannot doubt that its cultivation was general in Mexico towards the

* *De plantis esculentis commentatio botanica*, 1786, p. 28. *Histoire naturelle et generale des Isles et terre ferme de la grande mer oceane*, 1556, p. 112—114.

† Christophori Columbi navigatio. De gentibus ab Alonzo repertis. De navigatione Pinzoni socij admirantis. Navigatio Alberici Vesputij. See *Grynæi orbis nov.* editio, 1555, p. 64, 84, 85, 87, 211.

end of the 16th century, at an epoqua when a crowd of vegetables of less utility to man had already been carried there from Spain, the Canary Islands, and Peru. The silence of authors is not a sufficient proof in favour of M. Forster's opinion.

It is, perhaps, with the true country of the bananas as with that of the pear and cherry trees. The *prunus avium*, for example, is indigenous in Germany and France, and has existed from the most remote antiquity in our forests, like the robur and the linden tree; while other species of cherry trees which are considered as varieties become permanent, and of which the fruits are more savoury than the prunus avium, have come to us through the Romans from Asia Minor*, and particularly from the kingdom of Pontus. In the same manner, under the name of banana, a great number of plants, which differ essentially in the form of their fruits, and which, perhaps, constitute true species, are cultivated in the equinoxial regions, and even to the parallel of 33 or 34 degrees. If it is an opinion not yet proved, that all the pear trees which are cultivated descend from the wild pear tree as a common stock, we are still more entitled to doubt whether the great number

* *Desfontaines, Histoire des arbres et arbrisseaux qui peuvent etre cultivées sur le sol de la France*, 1809. t. II. p. 208, a work which contains very learned and curious researches with respect to the country of useful vegetables, and the epoqua of their first cultivation in Europe.

of constant varieties of the banana descend from the musa troglodytarum, cultivated in the Molucca Islands, which itself, according to Gaertner, is not perhaps a musa, but a species of the genus ravenala of Adanson.

The musae, or *pisangs*, described by Rumphius and Rheede, are not all known in the Spanish colonies. Three species, however, are there distinguished, still very imperfectly determined by botanists, the true *platano* or *arton* (musa paradisiaca Lin?); the *camburi* (M. Sapientum Lin?); and the *dominico* (M. regia Rumph?). I have seen a fourth species of very exquisite taste cultivated in Peru, the *meiya* of the South Sea, which is called in the market of Lima the *platano de taiti*, because the first roots of it were brought in the frigate Aguila from the island of Otaheite. Now it is a constant tradition in Mexico and all the continent of South America, that the platano arton and the dominico were cultivated there long before the arrival of the Spaniards, but that the *guineo*, a variety of the camburi, as its name proves, came from the coast of Africa. The author, who has most carefully marked the different epoquas at which American agriculture was enriched with foreign productions, the Peruvian Garcilasso de la Vega* expressly says, "that in the time of the

* *Comentarios Reales de los Incas*, vol. I. p. 282. The small musky banana, the *dominico*, the fruit of which appeared to

Incas the maize, quinoa, potatoes, and in the warm and temperate regions, bananas constituted the basis of the nourishment of the natives. He describes the musa of the vallies of the Antis, and he even distinguishes the most rare species with small sugary and aromatic fruit, the *dominico*, from the common or *arton* banana. Father Acosta also affirms*, though not so positively, that the musa was cultivated by the Americans before the arrival of the Spaniards. "The banana," says he, "is a fruit to be found in all the Indies, though there are people who pretend that it is a native of Ethiopia, and that it came from thence into America." On the banks of the Orinoco, the Cassiquiare, or the Beni, among the mountains de l'Esmeralda and the sources of the river Carony, in the midst of the thickest forests, wherever we discover Indian tribes who have had no connections with European establishments, we find plantations of manioc and bananas.

Father Thomas de Berlangas could not trans-

me most savoury in the province of Jaen de Bracamorros on the banks of the Amazon and the Chamaya, seems to be the same with the musa maculata of Jacquin (hortus Schœnbrunnensis, tab. 440), and with the musa regia of Rumphius. The latter species is itself, perhaps, but a variety of the musa mensaria. There exists, and the fact is very curious, in the forests of Amboine a wild banana, of which the fruit is without grains, the pisang jacki (Rumph. V. p. 138).

* *Historia natural de Indias*, 1608, p. 250.

port from the Canary Islands to St. Domingo any other species but the one which is there cultivated, the *camburi* (caule nigrescente striato fructu minore ovato-elongato), and not the *platano arton* or *zapalote* of the Mexicans (caule albo-virescente laevi, fructu longiore apicem versus subarcuato acute trigono). The first of these species only grows in temperate climates, in the Canary Islands, at Tunis, Algiers, and the coast of Malaga. In the valley of Caraccas also, placed under the 10° 30′ of latitude, but at 900 metres* of absolute elevation, we find only the *camburi* and the *dominico* (caule albo-virescente, fructu minimo obsolete trigono), and not the *platano arton*, of which the fruit only ripens under the influence of a very high temperature. From these numerous proofs we cannot doubt that the banana which several travellers pretend to have found wild at Amboina, at Gilolo, and the Mariana Islands, was cultivated in America long before the arrival of the Spaniards, who merely augmented the number of the indigenous species. However, we are not to be astonished that there was no musa seen in the island of St. Domingo before 1516. Like the animals around them, savages generally draw their nourishment from one species of plant. The forests of Guayana afford numerous examples of tribes whose plantations (*conucos*) contain

* 2952 feet. *Trans.*

manihot, arum or dioscorea, and not a single banana.

Notwithstanding the great extent of the Mexican table-land, and the height of the mountains in the neighbourhood of the coast, the space of which the temperature is favourable for the cultivation of the musa is more than 50,000 square leagues, and inhabited by nearly a million and a half of inhabitants. In the warm and humid vallies of the intendancy of Vera Cruz, at the foot of the Cordillera of Orizaba, the fruit of the *platano arton* sometimes exceeds three decimetres*, and often from twenty to twenty-two centimetres † (from 7 to 8 inches) in length. In these fertile regions, especially in the environs of Acapulco, San Blas, and the Rio Guasacualco, a cluster (*regime*) of bananas contains from 160 to 180 fruits, and weighs from 30 to 40 kilogrammes ‡.

I doubt whether there is another plant on the globe which on so small a space of ground can produce so considerable a mass of nutritive substance. Eight or nine months after the sucker has been planted, the banana commences to develop its clusters; and the fruit may be collected in the tenth or eleventh month. When the stalk is cut, we find constantly among the numerous shoots which have put forth roots a sprout (*pim-*

* 11.8 inches. *Trans.* † 7.87 to 8.66 inches. *Trans.*
‡ From 66 to 88lb. avoird. *Trans.*

pollo), which having two-thirds of the height of the mother-plant, bears fruit three months later. In this manner a plantation of musa, called in the Spanish colonies *platanar*, is perpetuated without any other care being bestowed by man than to cut the stalks of which the fruit has ripened, and to give the earth once or twice a year a slight dressing by digging round the roots. A spot of ground of a hundred square metres* of surface may contain at least from thirty to forty banana plants. In the space of a year, this same ground, reckoning only the weight of a cluster at from 15 to 20 kilogrammes †, yields more than two thousand kilogrammes ‡, or four thousand pounds of nutritive substance. What a difference between this produce and that of the cereal gramina in the most fertile parts of Europe! Wheat, supposing it sown and not planted in the Chinese manner, and calculating on the basis of a decuple harvest, does not produce on a hundred square metres more than 15 kilogrammes §, or 30 pounds of grain. In France, for example, the *demi-hectare*, or legal *arpent*, of 1344¼ square toises ‖ of good land is sown (*à la volée*) with 160lb. of grain, and if the land is not so good or absolutely bad with

* 1076 square feet. *Trans.*

† From 33 to 44lb. avoird. *Trans.*

‡ 4414lb. avoird. *Trans.* § 33lb. avoird. *Trans.*

‖ 54,995 square feet. *Trans.*

200 or 220 pounds. The produce varies from 1000 to 2500 pounds per acre. The potatoe, according to M. Tessie, yields in Europe on a hundred square acres of well cultivated and well manured ground a produce of 45 kilogrammes *, or 90 pounds of roots. We reckon from 4 to 6000 pounds to the legal arpent. The produce of bananas is consequently to that of wheat as 133:1, and to that of potatoes as 44:1.

Those who in Europe have tasted bananas ripened in hot-houses have a difficulty in conceiving that a fruit which from its great mildness has some resemblance to a dried fig can be the principal nourishment of many millions of men in both Indies. We seem to forget that in the act of vegetation the same elements form very different chemical mixtures according as they combine or separate. How should we even discover in the lacteous mucilage which the grains of gramina contain before the ripening of the ear the farinaceous perisperma of the cerealia, which nourishes the majority of the nations of the temperate zone? In the musa, the formation of the amylaceous matter precedes the epoqua of maturity. We must distinguish between the banana fruit collected when green, and what is allowed to grow yellow on the plant. In the second the sugar is quite formed; it is mixed with the pulp, and in

* 99lb. avoird. *Trans.*

such abundance that if the sugar-cane was not cultivated in the banana region, we might extract sugar from this fruit to greater advantage than is done in Europe from red beet and the grape. The banana, when gathered green, contains the same nutritive principle which is observed in grain, rice, the tuberose roots, and the sagou, namely the amylaceous sediment united with a very small portion of vegetable gluten. By kneading with water meal of bananas dried in the sun, I could only obtain a few atoms of this ductile and viscous mass, which resides in abundance in the perisperma, and especially in the embryo of the cerealia. If, on the one hand, the gluten which has so much analogy to animal matter, and which swells with heat, is of great use in the making of bread; on the other hand, it is not indispensable to render a root or fruit nutritive. M. Proust discovered gluten in beans, apples, and quinces; but he could not discover any in the meal of potatoes. Gums, for example, that of the mimosa nilotica (acacia vera Willd.), which serves for nourishment to several African tribes in their passages through the desert, prove that a vegetable substance may be a nutritive aliment without containing either gluten or amylaceous matter.

It would be difficult to describe the numerous preparations by which the Americans render the fruit of the musa, both before and after its maturity, a wholesome and agreeable diet. I have fre-

quently seen in ascending rivers, that the natives, after the greatest fatigues, make a complete dinner on a very small portion of manioc and three bananas *(platano arton)* of the large kind. In the time of Alexander, if we are to credit the ancients, the philosophers of Hindostan were still more sober. "Arbori nomen *pdlæ* pomo arienæ, quo sapientes Indorum vivunt. Fructus admirabilis succi dulcedine ut uno quaternos satiet." (Plin. XII. 12). In warm countries the people in general not only consider sugary substances as a food which satisfies for the moment, but as truly nutritive. I have frequently observed, that the mule-drivers who carried our baggage on the coast of Caraccas gave the preference to unprepared sugar (papelon) over fresh animal food.

Physiologists have not yet determined with precision what characterises a substance eminently nutritive. To appease the appetite by stimulating the nerves of the gastric system, and to furnish matter to the body which may easily assimilate with it, are modes of action very different. Tobacco, the leaves of the erythroxylon cocca mixed with quick lime, the opium which the natives of Bengal have frequently used for whole months in times of scarcity, will appease the violence of hunger; but these substances act in a very different manner from wheaten bread, the root of the jatropha, gum-arabic, the lichen of Iceland, or the putrid fish which is the principal food of several

tribes of African negroes. There can be no doubt, the bulk being equal, superazoted matter, or animals, are more nutritive than vegetable matter; and it appears that among vegetables gluten is more nutritive than starch, and starch more than mucilage; but we must beware of attributing to these insulated principles what depends, in the action of the aliment on living bodies, on the varied mixture of hydrogen, carbonate, and oxygen. Hence a matter becomes eminently nutritive if it contains, like the bean of the cocoa-tree (theobroma cacao), besides the amylaceous matter, an aromatic principle which excites and fortifies the nervous system.

These considerations, to which we cannot give more development here, will serve to throw some light on the comparisons which we have already made of the produce of different modes of cultivation. If we draw from the same space of ground three times as many potatoes as wheat in weight, we must not therefore conclude that the cultivation of tuberous plants will on an equal surface maintain three times as many individuals as the cultivation of cereal gramina. The potatoe is reduced to the fourth part of its weight when dried by a gentle heat; and the dry starch that can be separated from 2,300 kilogrammes, the produce of half a hectare of ground, would hardly equal the quantity furnished by 800 kilogrammes of wheat. It is the same with the fruit of the ba-

nana, which before its maturity, even in the state in which it is very farinaceous, contains much more water and sugary pulp than the seeds of gramina. We have seen that the same extent of ground in a favourable climate will yield 106,000 kilogrammes of bananas, 2,400 kilogrammes of tuberous roots, and 800 kilogrammes of wheat. These quantities bear no proportion to the number of individuals which can be maintained by these different kinds of cultivation on the same extent of ground. The aqueous mucilage which the banana contains, and the tuberous root of the solanum, possess undoubted nutritive properties. The farinaceous pulp, such as is presented by nature, yields undoubtedly more aliment than the starch which is separated from it by art. But the weights alone do not indicate the absolute quantities of nutritive matter; and to show the amount of the aliment which the cultivation of the musa yields on the same space of ground to man more than the cultivation of wheat, we ought rather to calculate according to the mass of vegetable substance necessary to satisfy a full-grown person. According to this last principle, and the fact is very curious, we find that in a very fertile country a demi hectare, or legal arpent *, cultivated with bananas of the large species *(platano arton)*, is capable of maintaining 50 individuals; when the same arpent in

* 54,098 square feet. *Trans.*

Europe would only yield annually, supposing the eighth grain 576 kilogrammes * of flour, a quantity not equal to the subsistence of two individuals†. Accordingly, a European newly arrived in the torrid zone is struck with nothing so much as the extreme smallness of the spots under cultivation round a cabin which contains a numerous family of Indians.

The ripe fruit of the musa, when exposed to the sun, is preserved like our figs. The skin becomes black and takes a particular odour, which resembles that of smoked ham. The fruit in this state is called *platano passado*, and becomes an object of commerce in the province of Michuacan. This dry banana is an aliment of an agreeable taste, and extremely healthy. But those Europeans who newly arrive consider the ripe fruit of the *platano arton*, newly gathered, as very ill to digest. This opinion is very ancient, for Pliny relates that Alexander gave orders to his soldiers to touch none of the bananas which grow on the banks of the Hyphasus. Meal is extracted from the musa by cutting the green fruit into slices, drying it in the sun on a slope, and pounding it when it

* 1,271 lb. avoird. *Trans.*

† We have calculated on the following principles: 100 kilogrammes of wheat yield 72 kilogrammes of flour, and 16 kilogrammes of flour are convertible into 21 kilogrammes of bread. The maintenance of one individual is computed at 547 kilogrammes (1207lb. avoird.) annually.

becomes friable. This flour, less used in Mexico than in the islands*, may serve for the same use as flour from rice or maize.

The facility with which the banana is reproduced from its roots gives it an extraordinary advantage over fruit-trees, and even over the bread-fruit tree, which for eight months in the year is loaded with farinaceous fruit. When tribes are at war with one another and destroy the trees, the disaster is felt for a long time. A plantation of bananas is renewed by suckers in the space of a few months.

We hear it frequently repeated in the Spanish colonies, that the inhabitants of the warm region (tierra caliente) will never awake from the state of apathy in which for centuries they have been plunged, till a royal *cedula* shall order the destruction of the banana plantations (*platanares*). The remedy is violent, and those who propose it with so much warmth do not in general display more activity than the lower people, whom they would force to work by augmenting the number of their wants. It is to be hoped that industry will make progress among the Mexicans without recurring to means of destruction. When we consider, however, the facility with which our species can be maintained in a climate where bananas are produced, we are not to be astonished that in the equinoxial region of the new continent civilization first commenced

* See the interesting Memoir of M. de Tussac, in his *Flore des Antilles*, p. 60.

on the mountains in a soil of inferior fertility, and under a sky less favourable to the development of organized beings, in whom necessity even awakes industry. At the foot of the Cordillera, in the humid vallies of the intendancies of Vera Cruz, Valladolid, and Guadalaxara, a man who merely employs two days in the week in a work by no means laborious may procure subsistence for a whole family. Yet such is the love of his native soil, that the inhabitant of the mountains, whom the frost of a single night frequently deprives of the whole hopes of his harvest, never thinks of descending into the fertile but thinly inhabited plains, where nature showers in vain her blessings and her treasures.

The same region in which the banana is cultivated produces also the valuable plant of which the root affords the flour of *manioc*, or *magnoc*. The green fruit of the musa is eaten dressed, like the bread fruit, or the tuberous root of the potatoe; but the flour of the manioc is converted into bread, and furnishes to the inhabitants of warm countries what the Spanish colonists call *pan de tierra caliente*. The maize, as we shall afterwards see, affords the great advantage of being cultivated under the tropics, from the level of the ocean to elevations which equal those of the highest summits of the Pyrenees. It possesses that extraordinary flexibility of organization for which the vegetables of the family of the gramina are charac-

terised; and it even possesses it in a higher degree than the cerealia of the old continent, which suffer under a burning sun, while the maize vegetates vigorously in the warmest regions of the earth. The plant whose root yields the nutritive flour of the *manioc* takes its name from *juca*, a word of the language of *Haity*, or St. Domingo. It is only successfully cultivated within the tropics; and the cultivation of it in the mountainous part of Mexico never rises above the absolute height of six or eight hundred metres *. This height is much surpassed by that of the *camburi*, or banana of the Canaries, a plant which grows nearer the central table-land of the Cordilleras.

The Mexicans, like the natives of all equinoxial America, have cultivated, from the remotest antiquity, two kinds of *juca*, which the botanists, in their inventory of *species*, have united under the name of jatropha manihot. They distinguish, in the Spanish colony the sweet (*dulce*) from the tart or bitter (*amarga*) juca. The root of the former, which bears the name of *camagnoc* at Cayenne, may be eaten without danger, while the other is a very active poison. The two may be made into bread; however, the root of the bitter juca is generally used for this purpose, the poisonous juice of which is carefully separated from the fecula before making the bread of the manioc,

* 1968 and 2624 feet. *Trans.*

called *cazavi*, or *cassave*. This separation is operated by compressing the root after being grated down in the *cibucan*, which is a species of long sack. It appears from a passage of Oviedo (lib. vii. c. 2), that the juca dulce, which he calls *boniata*, and which is the *huacamote* of the Mexicans, was not found originally in the West India islands, and that it was transplanted from the neighbouring continent. "The *boniata*," says Oviedo, "is like that of the continent; it is not poisonous, and may be eaten with its juice either raw or prepared." The natives carefully separate in their fields (*conucos*) the two species of jatropha.

It is very remarkable that plants, of which the chemical properties are so very different, are yet so very difficult to distinguish from their exterior characters. Brown, in his Natural History of Jamaica, imagined he found these characters in dissecting the leaves. He calls the sweet juca, *sweet cassava*, jatropha foliis palmatis lobis incertis; and the bitter or tart juca, *common cassava*, jatropha foliis palmatis pentadactylibus. But having examined many plantations of *manihot*, I found that the two species of jatropha, like all cultivated plants with lobed or palmated leaves, vary prodigiously in their aspect. I observed that the natives distinguish the sweet from the poisonous manioc, not so much from the superior whiteness of the stalk and the reddish colour of the leaves as from the

taste of the root, which is not tart or bitter. It is with the cultivated jatropha as with the sweet orange-tree, which botanists cannot distinguish from the bitter orange-tree, but which, however, according to the beautiful experiments of M. Galesio, is a primitive species, propagated from the grain, as well as the bitter orange-tree. Several naturalists, from the example of Doctor Wright, of Jamaica, have taken the sweet juca for the true jatropha janipha of Linnæus, or the jatropha frutescens of Löffling *. But this last species, which is the jatropha carthaginensis of Jacquin, differs from it essentially by the form of the leaves (lobis utrinque sinuatis), which resemble those of the papayer. I very much doubt whether the jatropha can be transformed by cultivation into the jatropha manihot. It appears equally improbable that the sweet juca is a poisonous jatropha, which, by the care of man, or the effect of a long cultivation, has gradually lost the acidity of its juices. The *juca amarga* of the American fields has remained the same for centuries, though planted and cultivated like the *juca dulce*. Nothing is more mysterious than this difference of interior organization in cultivated vegetables, of which the exterior forms are nearly the same.

Raynal † has advanced that the manioc was

* Reza til Spanska Loenderna, 1758, p. 309.

† *Histoire Philosophique*, tom. iii. p. 212-214.

transplanted from Africa to America to serve for the maintenance of the negroes, and that if it existed on the continent before the arrival of the Spaniards, it was not, however, known by the natives of the West Indies in the time of Columbus. I am afraid that this celebrated author, who describes, however, accurately enough in general objects of natural history *, has confounded the manioc with the ignames; that is to say, the jatropha with a species of dioscorea. I should wish to know by what authority we can prove that the manioc was cultivated in Guinea from the remotest period. Several travellers have also pretended that the maize grew wild in this part of Africa, and yet it is certain that it was transported there by the Portuguese in the 16th century. Nothing is more difficult to resolve than the problem of the migration of the plants useful to man, especially since communications have become so frequent between all continents. Fernandez de Oviedo, who went in 1513 to the island of Hispaniola, or St. Domingo, and who for more than twenty years inhabited different parts of the new continent, speaks of the manioc as of a very ancient cultivation, and peculiar to America. If, how-

* This character of Raynal by no means agrees with that given by Mr. Edwards, who says that the descriptions in Raynal are in general no more to be relied on than any description in romance. *Trans.*

ever, the negro slaves introduced the manioc, Oviedo would himself have seen the commencement of this important branch of tropical agriculture. If he had believed that the jatropha was not indigenous in America, he would have cited the epoqua at which the first maniocs were planted, as he relates in the greatest detail the first introduction of the sugar-cane, the banana of the Canaries, the olive, and the date. Amerigo Vespucci relates in his letter addressed to the Duke of Loraine *, that he saw bread made of the manioc on the coast of Paria in 1497. "The natives," says this adventurer, in other respects by no means accurate in his recital, "know nothing of our corn and our farinaceous grains; they draw their principal subsistence from a root which they reduce into meal, which some of them call *jucha*, others *chambi*, and others *igname*." It is easy to discover the word *jucca* in *jucha*. As to the word *igname*, it now means the root of the *dioscorea alata*, which Columbus † describes under the name of *ages*, and of which we shall afterwards speak. The natives of Spanish Guayana who do not acknowledge the dominion of the Europeans have cultivated the manioc from the remotest antiquity. Running out of provisions in *repassing* the *rapids* of the Orinoco, on our return from the Rio Negro we applied to the tribe of Piraoas

* *Grynæus*, p. 215. † *Ibidem.*

Indians, who dwell to the east of the Maypures, and they supplied us with jatropha bread. There can therefore remain no doubt that the manioc is a plant of which the cultivation is of a much earlier date than the arrival of the Europeans and Africans into America.

The manioc bread is very nutritive, perhaps on account of the sugar which it contains, and a viscuous matter which unites the farinaceous molecules of the cassava. This matter appears to have some analogy with the Caoutchouc, which is so common in all the plants of the groupe of the tithymaloides. They give to the cassava a circular form. The disks, which are called *turtas*, or *xauxau* in the old language of Haity, have a diameter of from five to six decimeters *, or three millimetres † of thickness. The natives, who are much more sober than the whites, generally eat less than half a kilogramme ‡ of manioc per day. The want of gluten mixed with the amylaceous matter, and the thinness of the bread, render it extremely brittle and difficult of transportation. This inconvenience is particularly felt in long navigations. The fecula of manioc grated, dried, and smoked, is almost inalterable. Insects and worms never attack it, and every traveller knows in equinoxial America the advantages of the *couaque*.

* From 19.685 inches to 23.622 inches. *Trans.*

† .118 of an inch. *Trans.* ‡ About a pound. *Trans.*

It is not only the fecula of the *juca amarga* which serves for nourishment to the Indians, they use also the juice of the root, which in its natural state is an active poison. This juice is decomposed by fire. When kept for a long time in ebullition it loses its poisonous properties gradually as it is skimmed. It is used without danger as a sauce, and I have myself frequently used this brownish juice, which resembles a very nutritive *bouillon*. At Cayenne* it is thickened to make *cabiou*, which is analogous to the *soay* brought from China, and which serves to season dishes. From time to time very serious accidents happen when the juice has not been long enough exposed to the heat. It is a fact very well known in the islands, that formerly a great number of the natives of *Haity* killed themselves voluntarily by the raw juice of the root of the *juca amarga*. Oviedo relates, as an eye-witness, that these unhappy wretches, who, like many African tribes, preferred death to involuntary labour, united together by fifties to swallow at once the poisonous juice of the jatropha. This extraordinary contempt of life characterises the savage in the most remote parts of the globe.

Reflecting on the union of accidental circumstances which have determined nations to this or that species of cultivation, we are astonished to

* *Aublet Hist. des Plantes de la Guyane Françoise*, tom. ii. p. 72.

see the Americans, in the midst of the richness of their country, seek in the poisonous root of a tithymaloid the same amylaceous substance which other nations have found in the family of gramina, in bananas, asparagus (dioscorea alata), aroides (arum macrorrhizen. Dracontium polyphillum), solana, lizerons (convolvulus batatas, c. chrysorhizus), narcissi (tacca pinnatifida), polygonoi (p. fagopyrum), urticæ (artocarpus, legumens and arborescent ferns (cycas circinnalis). We ask why the savage who discovered the jatropha manihot did not reject a root of the poisonous qualities of which a sad experience must have convinced him before he could discover its nutritive properties? But the cultivation of the *juca dulce*, of which the juice is not deleterious, preceded perhaps that of the *juca amarga*, from which the manioc is now taken. Perhaps also the same people who first ventured to feed on the root of the jatropha manihot had formerly cultivated plants analogous to the arum and the dracontium, of which the juice is acrid, without being poisonous. It was easy to remark, that the fecula extracted from the root of an aroid is of a taste so much the more agreeable, as it is carefully washed to deprive it of its milky juice. This very simple consideration would naturally lead to the idea of expressing the fecula, and preparing it in the same manner as the manioc. We can conceive that a people who knew how to *dulcify* the roots of an aroid could

undertake to nourish themselves on a plant of the groupe of the euphorbia. The transition is easy, though the danger is continually augmenting. In fact, the natives of the Society and Molucca islands, who are unacquainted with the jatropha manihot, cultivate the arum macrorrhizon and the tacca pinnatifida. The root of this last plant requires the same precaution as the manioc, and yet the tacca bread competes in the market of Banda with the sagou bread.

The cultivation of the manioc requires more care than that of the banana. It resembles that of potatoes, and the harvest takes place only from seven to eight months after the slips have been planted. The people who can plant the jatropha have already made great advances towards civilization. There are even varieties of the manioc, for example, those which are called at Cayenne *manioc bois blanc*, and *manioc mai-pourri-rouge*, of which the roots can only be pulled up at the end of fifteen months. The savage of New Zealand would not certainly have the patience to wait for so tardy a harvest.

Plantations of jatropha manihot are now found along the coast from the mouth of the river of Guasacualco to the north of Santander, and from Tehuantepec to San Blas and Sinaloa, in the low and warm regions of the intendancies of Vera Cruz, Oaxaca, Puebla, Mexico, Valladolid, and Guadalaxara. M. Aublet, a judicious botanist,

who, happily, has not disdained in his travels to inquire into the agriculture of the tropics, says very justly, "that the manioc is one of the finest and most useful productions of the American soil, and that with this plant the inhabitant of the torrid zone could dispense with rice and every sort of wheat, as well as all the roots and fruits which serve as nourishment to the human species."

Maize occupies the same region as the banana and the manioc; but its cultivation is still more important and more extensive, especially than that of the two plants which we have been describing. Advancing towards the central table-land we meet with fields of maize all the way from the coast to the valley of Toluca, which is more than 2800 metres * above the level of the ocean. The year in which the maize harvest fails is a year of famine and misery for the inhabitants of Mexico.

It is no longer doubted among botanists, that maize, or Turkey corn, is a true American grain, and that the old continent received it from the new. It appears also that the cultivation of this plant in Spain long preceded that of potatoes. Oviedo †, whose first essay on the natural history of the Indies was printed at Toledo in 1525, says that he saw maize cultivated in Andalusia, near

* 9185 feet. *Trans.*

† *Rerum Medicarum Novæ Hispaniæ Thesaurus*, 1651, lib. vii. c. 40. p. 247.

the chapel of Atocha, in the environs of Madrid. This assertion is so much the more remarkable, as from a passage of Hernandez (book vii. chap. 40) we might believe that maize was still unknown in Spain in the time of Philip the Second, towards the end of the 16th century.

On the discovery of America by the Europeans, the zea maize (*tlaolli* in the Aztec language, *mahiz* in the Haitian, and *cara* in the Quichua) was cultivated from the most southern part of Chili to Pennsylvania. According to a tradition of the Aztec people, the Toultecs, in the 7th century of our æra, were the first who introduced into Mexico the cultivation of maize, cotton, and pimento. It might happen, however, that these different branches of agriculture existed before the Toultecs, and that this nation, the great civilization of which has been celebrated by all the historians, merely extended them successfully. Hernandez informs us, that the Otamites even, who were only a wandering and barbarous people, planted maize. The cultivation of this grain consequently extended beyond the *Rio Grande de Santiago*, formerly called Tololotlan.

The maize introduced into the north of Europe suffers from the cold wherever the mean temperature does not reach seven or eight degrees of the centigrade thermometer *. We therefore see

* 44° or 46° of Fahrenheit. *Trans.*

rye, and especially barley, vegetate vigorously on the ridge of the Cordilleras, at heights where, on account of the roughness of the climate, the cultivation of maize would be attended with no success. But, on the other hand, the latter descends to the warmest regions of the torrid zone, even to plains where wheat, barley, and rye cannot develope themselves. Hence on the scale of the different kinds of cultivation, the maize, at present, occupies a much greater extent in the equinoxial part of America than the cerealia of the old continent. The maize, also, of all the grains useful to man, is the one whose farinaceous perisperma has the greatest volume.

It is commonly believed that this plant is the only species of grain known by the Americans before the arrival of the Europeans. It appears, however, certain enough, that in Chili in the fifteenth century, and even long before, besides the zea maize and the zea curagua, two gramina called *magu* and *tuca* were cultivated, of which, according to the Abbe Molina, the first was a species of rye, and the second a species of barley. The bread of this araucan bread went by the name of *cocque*, a word which afterwards was applied to the bread made of European corn*. Hernandez even pretends to have found among the Indians of Mechoacan a species of wheat†, which, according to

* *Molina, Histoire naturelle du Chili*, p. 101.

† *Hernandez*, p. VII. 43. *Clavigero*, I. p. 56, note F.

his very succinct description, resembles the *corn of abundance* (*triticum compositum*), which is believed to be a native of Egypt. Notwithstanding every information which I procured during my stay in the intendancy of Valladolid, it was impossible for me to clear up this important point in the history of cerealia. Nobody there knew any thing of a wheat peculiar to the country, and I suspect that Hernandez gave the name of *triticum michuacanense* to some variety of European grain become wild and growing in a very fertile soil.

The fecundity of the *tlaolli*, or Mexican maize, is beyond any thing that can be imagined in Europe. The plant, favoured by strong heats and much humidity, acquires a height of from two to three metres *. In the beautiful plains which extend from San Juan del Rio to Queretaro, for example in the lands of the great plantation of l'Esperanza, one fanega of maize produces sometimes eight hundred. Fertile lands yield, communibus annis, from three to four hundred. In the environs of Valladolid a harvest is reckoned bad which yields only the seed 130 or 150 fold. Where the soil is even most sterile it still returns from sixty to eighty grains for one. It is believed that we may estimate the produce of maize in general, in the equinoxial region of the kingdom of New Spain, at a hundred and fifty for one. The valley

* From $6\frac{1}{2}$ to $9\frac{3}{16}$ feet. *Trans.*

of Toluca alone yields annually more than 600,000 fanegas * on an extent of thirty square leagues, of which a great part is cultivated in agave. Between the parallels of 18° and 22° the frosts and cold winds render this cultivation by no means lucrative on plains whose height exceeds three thousand metres †. The annual produce of maize in the intendancy of Guadalaxara is, as we have already observed, more than 80 millions of kilogrammes ‡.

Under the temperate zone, between the 33° and 38° of latitude, in New California for example, maize produces in general only, communibus annis, from 70 to 80 for one. By comparing the manuscript memoirs of Father Fermin Lassuen which I possess with the statistical tables published in the historical account of the voyage of M. de Galeano, I should be enabled to indicate village by village the quantities of maize sown and reaped. I find that in 1791 twelve missions of New California || reaped 7625 fanegas on a piece of ground sown with 96. In 1801 the harvest of 10 missions was 466 fanegas, while the quantity sown only amounted to 66. Hence for the former year

* A *fanega* weighs four arrobas or a hundred pounds, in some provinces 120 pounds (from 50 to 60 kilogrammes). *Author.* 0 0.000 fanegas therefore =66,210,600 lbs. *Trans.*

† 9842 feet. *Trans.*

‡ 176,562,400 lbs avoirdupoise. *Trans.*

|| *Viage de la Sutil*, p. 168.

the produce was 79, and for the latter 70 for one. This coast in general appears better adapted for the cultivation of the cerealia of Europe. However it is proved by the same tables, that in some parts of New California, for example, in the fields belonging to the villages of San Buena Ventura and Capistrano, the maize has frequently yielded from 180 to 200 for one.

Although a great quantity of other grain is cultivated in Mexico, the maize must be considered as the principal food of the people, as also of the most part of the domestic animals. The price of this commodity modifies that of all the others, of which it is, as it were, the natural measure. When the harvest is poor, either from the want of rain or from premature frost, the famine is general, and produces the most fatal consequences. Fowls, turkies, and even the larger cattle, equally suffer from it. A traveller who passes through a country in which the maize has been frost bit finds neither egg nor poultry, nor *arepa* bread, nor meal for the *atolli*, which is a nutritive and agreeable soup. The dearth of provisions is especially felt in the environs of the Mexican mines; in those of Guanaxuato, for example, where fourteen thousand mules, which are necessary in the process of amalgamation, annually consume an enormous quantity of maize. We have already mentioned the influence which dearths have periodically had on the progress of population in New

Spain. The frightful dearth of 1784 was the consequence of a strong frost, which was felt at an epoqua when it was least to be expected in the torrid zone, the 28th August, and at the inconsiderable height of 1800 metres * above the level of the ocean.

Of all the gramina cultivated by man none is so unequal in its produce. This produce varies in the same field according to the changes of humidity and the mean temperature of the year, from 40 to 200 or 300 for one. If the harvest is good, the colonist makes his fortune more rapidly with maize than with wheat; and we may say that this cultivation participates in both the advantages and disadvantages of the vine. The price of maize varies from two livres ten sous to 25 livres the fanega. The mean price is five livres in the interior of the country; but it is increased so much by the carriage, that during my stay in the intendancy of Guanaxuato, the *fanega* cost at Salamanca 9, at Queretaro 12, and at San Luis Potosi 22 livres. In a country where there are no magazines, and where the natives merely live from hand to mouth, the people suffer terribly whenever the maize remains for any length of time at two piastres or ten livres the fanega. The natives then feed on unripe fruit, on cactus berries, and on roots. This insufficient food occasions diseases

* 5904 feet. *Trans.*

among them; and it is observed that famines are usually accompanied with a great mortality among the children.

In warm and very humid regions the maize will yield from two to three harvests annually; but generally only one is taken. It is sown from the middle of June till near the end of August. Among the numerous varieties of this gramen there is one of which the ear ripens two months after the grain has been sown. This precious variety is well known in Hungary, and M. Parmentier has endeavoured to introduce the cultivation of it into France. The Mexicans who inhabit the shores of the South Sea give the preference to another, which Oviedo* affirms he saw in his time, in the province of Nicaragua, and which is reaped in between thirty and forty days. I remember also to have observed it near Tomependa, on the banks of the river of the Amazons; but all these varieties of maize, of which the vegetation is so rapid appear to be of a less farinaceous grain, and almost as small as the zea curagua of Chili.

The utility which the Americans draw from maize is too well known for my dwelling on it. The use of rice is not more various in China and the East Indies. The ear is eaten boiled or roasted. The grain when beat yields a nutritive bread (*arepa*) though not fermented and ill baked, on

* Lib. VII. c. 1. p. 103.

account of the small quantity of gluten mixed with the amylaceous fecula. The meal is employed like gruel in the boullies, which the Mexicans call *atolli*, in which they mix sugar, honey, and sometimes even ground potatoes. The botanist Hernandez * describes sixteen species of atollis which were made in his time.

A chemist would have some difficulty in preparing the innumerable variety of spirituous, acid, or sugary beverages, which the Indians display a particular address in making, by infusing the grain of maize, in which the sugary matter begins to develope itself by germination. These beverages, generally known by the name of *chicha*, have some of them a resemblance to beer and others to cider. Under the monastic government of the Incas it was not permitted in Peru to manufacture intoxicating liquors, especially those which are called *Vinapu* and *Sora* †. The Mexican despots were less interested in the public and private morals; and drunkenness was very common among the Indians of the times of the Aztec dynasty. But the Europeans have multiplied the enjoyments of the lower people by the introduction of the sugar-cane. At present in every elevation the Indian has his particular drinks. The plains in

* Lib. VII. c. 40. p. 244.

† Garcilasso, lib. VIII. c. 9. (Tom. I. p. 277.) Acosta, lib. IV. c. 16. p. 238.

the vicinity of the coast furnish him with spirit from the sugar-cane, (*guarapo*, or *aguardiente de caña*), and the *chicha de manioc*. The *chicha de mais* abounds on the declivity of the Cordilleras. The central table-land is the country of the Mexican vines, the agave plantations, which supply the favourite drink of the natives, the *pulque de maguey*. The Indian in easy circumstances adds to these productions of the American soil a liquor still dearer and rarer, grape brandy (*aguardiente de Castilla*), partly furnished by European commerce, and partly distilled in the country. Such are the numerous resources of a people who love intoxicating liquors to excess.

Before the arrival of the Europeans, the Mexicans and Peruvians pressed out the juice of the maize-stalk to make sugar from it. They not only concentrated this juice by evaporation; they knew also to prepare the rough sugar by cooling the thickened syrup. Cortez, describing to the Emperor Charles V. all the commodities sold in the great market of Tlatelolco, on his entry into Tenochtitlan, expressly names the Mexican sugar. "There is sold," says he, "honey of bees and wax, *honey from the stalks of maize*, which are as sweet as sugar-cane, and honey from a shrub called by the people maguey. The natives make sugar of these plants, and this sugar they also sell." The stalk of all the gramina contains sugary matter, especially near the knots;

The quantity of the sugar that maize can furnish in the temperate zone appears, however, to be very inconsiderable; but under the tropics its fistulous stalk is so sugary that I have frequently seen the Indians sucking it as the sugar-cane is sucked by the negros. In the valley of Toluca the stalk of the maize is squeezed between cylinders, and then is prepared from its fermented juice a spirituous liquor, called *pulque de mahis*, or *tlaolli*, a liquor which becomes a very important object of commerce.

From the statistical tables drawn up in the intendancy of Guadalaxara, of which the population is more than half a million of inhabitants, it appears extremely probable that, *communibus annis*, the actual produce of maize in all New Spain amounts to more than 17 millions of fanegas, or more than 800 millions of kilogrammes * of weight. This grain will keep in Mexico, in the temperate climates, for three years, and in the valley of Toluca and all the levels of which the mean temperature is below 14 centigrade degrees†, for five or six years, especially if the dry stalk is not cut before the ripe grain has been somewhat struck with the frost.

In good years the kingdom of New Spain produces much more maize than it can consume.

1765½ millions of pounds avoirdupoise. *Trans.*

57° of Fahren.

As the country unites in a small space a great variety of climates, and as the maize almost never succeeds at the same time in the warm region *(tierras calientes)* and on the central table-land in the *terras frias*, the interior commerce is singularly vivified by the transport of this grain. Maize compared with European grain has the disadvantage of containing a smaller quantity of nutritive substance in a greater volume. This circumstance, and the difficulty of the roads on the declivities of the mountains, present obstacles to its exportation, which will be more frequent when the construction of the fine causeway from Vera Cruz to Xalapa and Perote shall be finished. The islands in general, and especially the island of Cuba, consume an enormous quantity of maize. These islands are frequently in want of it, because the interest of their inhabitants is almost exclusively fixed on the cultivation of sugar and coffee; although it has been long observed by well informed agriculturists, that in the district contained between the Havanah, the port of Batabano and Matanzas, fields cultivated with maize and by free hands yield a greater nett revenue than a sugar plantation, for which enormous advances are necessary in the purchase and maintenance of slaves and the construction of edifices.

If it is probable that in Chili formerly, besides maize, there were two other gramina with farinaceous seed sown, which belonged to the same

genus as our barley and wheat, it is no less certain that before the arrival of the Spaniards in America none of the cerealia of the old continent were known there. If we suppose that all mankind are descended from the same stock, we might be tempted to admit that the Americans, like the Atlantes *, separated from the rest of the human race before the cultivation of wheat on the central plains of Asia. But are we to lose ourselves in fabulous times to explain the ancient communications which appear to have existed between the two continents? In the time of Herodotus all the northern part of Africa presented no other agricultural nations but the Egyptians and the Carthaginians †. In the interior of Asia the tribes of the Mongol race, the Hiong-nu, the Burattes, the Kalkas, and the Sifanes, have constantly lived as wandering shepherds. Now, if the people of central Asia, or if the Lybians of Africa could have passed into the new continent, neither of them would have introduced the cultivation of cerealia. The want of these gramina then proves nothing either against the Asiatic origin of the Americans, or against the possibility of a very recent transmigration.

The introduction of European grain having had

* See the opinion of Diodorus Siculus. *Bibl. Rhodom.* lib. III. *page* 186.

† *Heeren über Africa*, p. 41.

the most beneficial influence on the prosperity of the natives of Mexico, it becomes interesting to relate at what epoqua this new branch of agriculture commenced. A negro slave of Cortez found three or four grains of wheat among the rice which served to maintain the Spanish army. These grains were sown, as it appears, before the year 1530. History has brought down to us the name of a Spanish lady, Maria d'Escobar, the wife of Diego de Chaves, who first carried a few grains of wheat into the city of Lima, then called Rimac. The produce of the harvest which she obtained from these grains was distributed for three years among the new colonists, so that each farmer received twenty or thirty grains. Garcilasso already complained of the ingratitude of his countrymen, who hardly knew the name of Maria d'Escobar. We are ignorant of the epoqua at which the cultivation of cerealia commenced in Peru, but it is certain that in 1547 wheaten bread was hardly known in the city of Cuzco *. At Quito the first European grain was sown near the convent of Saint Francis by Father Josse Rixi, a native of Gand, in Flanders. The monks still show there with enthusiasm the earthen vase in which the first wheat came from Europe, which they look upon as a precious

* *Commentarios reales*, ix. 24. t. ii. p. 332. "*Maria de Escobar, digna de un gran estado, llevò el trigo al Peru. Por otro tanto adoraron los gentiles a Ceres por Diosa, y de esta matrona no hicieron cuenta los de mi tierra.*"

relic *. Why have not every where the names of those been preserved, who, in place of ravaging the earth, have enriched it with plants useful to the human race †?

The temperate region, especially the climate when the mean heat of the year does not exceed from 18 to 19 centigrade degrees ‡, appears most favourable to the cultivation of cerealia, embracing under this denomination only the nutritive gramina known to the ancients, namely, wheat, spelt, barley, oats, and rye ‖. In fact, in the equinoxial part of Mexico, the cerealia of Europe are nowhere cultivated in plains of which the elevation is under from 8 to 9 hundred metres §; and we have already observed, that on the declivity of the Cordilleras between Vera Cruz and Acapulco, we generally see only the commencement of this cultivation at an elevation of 12 or 13 hundred metres ¶. A

* See my *Tableaux de la Nature*, t. II. p. 166.

† Every English reader will recollect the fine passage in Gulliver's Travels on this subject. *Trans.*

‡ 64° and 66° of Fahr. *Trans.*

‖ Triticum (πυρός), spelta (ζεα), hordeum (κριθη), avena (βρωμος of Dioscorides, and not the βρομος of Theophrastus), and secale (τιφη). I shall not here examine if wheat and barley were really cultivated by the Romans, and if Theophrastus and Pliny knew our *secale cereale*. Compare Dioscor. ii. 116. iv. 140. page Saracen. 126 and 294. with Columella, II. 10. and Theophr. VIII. 1—4. with Plin. II. 126.

§ From 2629 to 2952 feet. *Trans.*

¶ 3936 and 4264 feet. *Trans.*

long experience has proved to the inhabitants of Xalapa that the wheat sown around their city vegetates vigorously, but never produces a single ear. It is cultivated because its straw and its succulent leaves serve for forage *(zacate)* to cattle. It is very certain, however, that in the kingdom of Guatemala, and consequently nearer the equator, grain ripens at smaller elevations than that of the town of Xalapa. A particular exposure, the cool winds which blow in the direction of the north, and other local causes, may modify the influence of the climate. I have seen in the province of Caraccas the finest harvests of wheat near Victoria (latitude 10° 1′) at five or six hundred metres * of absolute elevation; and it appears that the wheaten fields which surround the *Quatro villas* in the island of Cuba (latitude 21° 58′) have still a smaller elevation. At the Isle of France (latitude 20° 10′) wheat is cultivated on a soil almost level with the ocean.

The European colonists have not sufficiently varied their experiments to know what is the *minimum* of height at which cerealia grow in the equinoxial region of Mexico. The absolute want of rain during the summer months is so much the more unfavourable to the wheat as the heat of the climate is greater. It is true that the droughts and heats are also very considerable in Syria and

* 1640 or 1968 feet. *Trans.*

Egypt; but this last country, which abounds so much in grain, has a climate which differs essentially from that of the torrid zone, and the soil preserves a certain degree of humidity from the beneficent inundations of the Nile. However, the vegetables, which are of the same kind with our cerealia, grow only wild in temperate climates, and even in those only of the old continent. With the exception of a few gigantic arundinaceous which are *social plants*, the gramina appear in general infinitely rarer in the torrid zone than in the temperate zone, where they have the ascendancy, as it were, over the other vegetables. We ought not, then, to be astonished that the cerealia, notwithstanding the great *flexibility* of organization attributed to them, and which is common to them with the domestic animals, thrive better on the central table-land of Mexico, in the hilly region, where they find the climate of Rome and Milan, than in the plains in the vicinity of the equinoxial ocean.

Were the soil of New Spain watered by more frequent rains, it would be one of the most fertile countries cultivated by man in the two hemispheres. The hero*, who, in the midst of a bloody war, had his eyes continually fixed on every branch of national industry, Hernan Cor-

* Letter to the Emperor Charles, dated from the great city of Temixtitan the 15th October, 1524.

tez, wrote to his sovereign shortly after the siege of Tenochtitlan: "All the plants of Spain thrive admirably in this land. We shall not proceed here as we have done in the isles, where we have neglected cultivation and destroyed the inhabitants. A sad experience ought to render us more prudent. I beseech your majesty to give orders to the Casa de *Contratacion* of Seville, that no vessel set sail for this country without a certain quantity of plants and grain." The great fertility of the Mexican soil is incontrovertible, but the want of water, of which we have spoke in the third chapter, frequently diminishes the abundance of the harvests.

There are only two seasons known in the equinoxial region of Mexico even as far as the 28° of north latitude: the rainy season *(estacion de las aguas)*, which begins in the month of June or July, and ends in the month of September or October, and the dry season *(el estio)*, which lasts eight months, from October to the end of May. The first rains generally commence on the eastern declivity of the Cordillera. The formation of the clouds and the precipitation of the water dissolved in the air, commence on the coast of Vera Cruz. These phenomena are accompanied with strong electrical explosions, which take place successively at Mexico, Guadalaxara, and on the western coast. The chemical action is propagated from east to west, in the direction of the trade

winds, and the rains begin fifteen or twenty days sooner at Vera Cruz than on the central table-land. Sometimes we see in the mountain, even below 2000 metres * of absolute height, rain mixed with rime *(gresil)* and snow in the months of November, December, and January; but these rains are very short, and only last from four to five days; and however cold they may be, they are considered as very useful for the vegetation of wheat and the pasturages. In Mexico in general as in Europe, the rains are most frequent in the mountainous regions, especially in that part of the Cordilleras which extends from the Pic d'Orizaba by Guanaxuato, Sierra de Pinos, Zacatecas, and Bolaños, to the mines of Guarisamey and the Rosario.

The prosperity of New Spain depends on the proportion established between the duration of two seasons of rain and drought. The agriculturist has seldom to complain of too great a humidity, and if sometimes the maize and the cerealia of Europe are exposed to partial inundations in the plains, of which several form circular basins shut in by the mountains, the grain sown on the slopes of the hills vegetates with so much the greater vigour. From the parallel of 24° to that of 30° the rains are seldomer and of short duration. Happily the

* 6561 feet. *Trans.*

snow, of which there is great abundance from the 26° of latitude, supplies the want of rain.

The extreme drought to which New Spain is exposed from the month of June to the month of September compels the inhabitants in a great part of this vast country to have recourse to artificial irrigations. The harvests of wheat are rich in proportion to the water taken from the rivers by means of canals of irrigation. This system is particularly followed in the fine plains which border the river Santiago, called *Rio Grande*, and in those between Salamanca, Irapuato, and the villa de Leon. Canals of irrigation (*acequias*), reservoirs of water (*presas*), and the hydraulical machines called *norias*, are objects of the greatest importance for Mexican agriculture. Like Persia and the lower part of Peru, the interior of New Spain is infinitely productive in nutritive gramina wherever the industry of man has diminished the natural dryness of the soil and the air.

Nowhere does the proprietor of a large farm more frequently feel the necessity of employing engineers skilled in surveying ground and the principles of hydraulic constructions. However, at Mexico, as elsewhere, those arts have been preferred which please the imagination to those which are indispensable to the wants of domestic life. They possess architects, who judge learnedly of the beauty and symmetry of an edifice; but no-

thing is still so rare there as to find persons capable of constructing machines, dikes, and canals. Fortunately the feeling of their want has excited the national industry, and a certain sagacity peculiar to all mountainous people supplies in some sort the want of instruction.

In the places which are not artificially watered the Mexican soil yields only pasturage to the months of March and April. At this period, when the south-west wind, which is dry and warm (*viento de la Mixteca*), frequently blows, all verdure disappears, and the gramina and other herbaceous plants gradually dry up. This change is more sensibly felt when the rains of the preceding year have been less abundant and the summer has been warmer. The wheat then, especially in the month of May, suffers much if it is not artificially watered. The rain only excites the vegetation in the month of June; with the first falls the fields become covered with verdure; the foliage of the trees is renewed; and the European who recalls to his mind incessantly the climate of his native country enjoys doubly this season of the rains, because it presents to him the image of spring.

In indicating the dry and rainy months we have described the course which the meteorological phenomena commonly follow. For several years, however, these phenomena appear to have deviated from the general law, and the exceptions have unfortunately been to the disadvantage of agriculture.

The rains have become more rare, and especially more tardy. The year in which I visited the Volcan de Jorullo the season of rain was three whole months later than usual; it began in the month of September, and only lasted till towards the middle of November. It is observed in Mexico that the maize, which suffers much more than the wheat from the frosts in autumn, has the advantage of recovering more easily after long droughts. In the intendancy of Valladolid, between Salamanca and the lake of Cuizeo, I have seen fields of maize which were believed to be destroyed vegetate with an astonishing vigour after two or three days of rain. The great breadth of the leaves undoubtedly contributes greatly to the nutrition and vegetative force of this American gramen.

In the farms (*haciendas de trigo*) in which the system of irrigation is well established, in those of Silao and Irapuato, for example, near Leon, the wheat is twice watered; first, when the young plant springs up in the month of January; and the second time in the beginning of March, when the ear is on the point of developing itself. Sometimes even the whole field is inundated before sowing. It is observed, that in allowing the water to remain for several weeks, the soil is so impregnated with humidity that the wheat resists more easily the long droughts. They scatter the seed (*semer a la volée*), at the moment when the waters begin to flow from the

opening of the canals. This method brings to mind the cultivation of wheat in Lower Egypt, and these prolonged inundations diminish at the same time the abundance of the parasitical herbs which mix with the harvest at reaping, and of which a part has unfortunately past into America with the European grain.

The riches of the harvests are surprising in lands carefully cultivated, especially in those which are watered or properly separated by different courses of labour. The most fertile part of the table-land is that which extends from Queretaro to the town of Leon. These elevated plains are thirty leagues in length by eight or ten in breadth. The wheat harvest is 35 and 40 for 1, and several great farms can even reckon on 50 or 60 to 1. I found the same fertility in the fields which extend from the village of Santiago to Yurirapundaro in the intendancy of Valladolid. In the environs of Puebla, Atlisco, and Zelaya, in a great part of the bishoprics of Michoacan and Guadalaxara, the produce is from 20 to 30 for 1. A field is considered there as far from fertile when a fanega of wheat yields only, *communibus annis*, 16 fanegas. At Cholula the common harvest is from 30 to 40, but it frequently exceeds from 70 to 80 for 1. In the valley of Mexico the maize yields 200 and the wheat 18 or 20. I have to observe that the numbers which I here give have all the accuracy which can be desired in so important an object for

the knowledge of territorial riches. Being eagerly desirous of knowing the produce of agriculture under the tropics, I procured all the information on the very spots; and I compared together the data with which I was furnished by intelligent colonists, who inhabited provinces at a distance from one another. I was induced to be so much the more precise in this operation, as from having been born in a country where grain scarcely produces four or five for one, I was naturally more apt than another to be disposed to suspect the exaggerations of agriculturists, exaggerations which are the same in Mexico, China, and wherever the vanity of the inhabitants wishes to take advantage of the credulity of travellers.

I am aware that on account of the great inequality with which different countries sow, it would have been better to compare the produce of the harvest with the extent of ground sown up. But the agrarian measures are so inexact, and there are so few farms in Mexico in which we know with precision, the number of square toises or varas which they contain, that I was obliged to confine myself to the simple comparison between the wheat reaped and the wheat sown. The researches to which I applied myself during my stay in Mexico gave me for result, *communibus annis*, the mean produce of all the country at 22 or 25 for 1. When I returned to Europe I began again to entertain doubts as to the precision of this im-

portant result, and I should perhaps have hesitated to publish it, if I had not had it in my power to consult on this subject quite recently and in Paris even, a respectable and enlightened person who has inhabited the Spanish colonies these thirty years, and who applied himself with great success to agriculture. M. Abad, a canon of the metropolitan church of Valladolid de Mechoacan, assured me, that from his calculations the mean produce of the Mexican wheat far from being below twenty-two grains, is probably from 25 to 30, which, according to the calculations of Lavoisier and Neckar, exceeds from five to six times the mean produce of France.

Near Zelaya the agriculturists showed me the enormous difference of produce between the lands artificially watered and those which are not. The former, which receive the water of the Rio Grande, distributed by drains into several pool , yield from 40 to 50 for 1; while the latter, which do not enjoy the benefit of irrigation, only yield fifteen or twenty. The same fault prevails here of which agricultural writers complain in almost every country of Europe, that of employing too much seed, so that the grain choaks itself. Were it not for this the produce of the h. rvests would still appear greater than what we have stated.

It may be of use to insert here an observation*

* *Sobre la fertilidad de las tierras en la Nueva España por Don Manuel Abad y Queipo,* (MS. note.)

made near Zelaya by a person worthy of confidence, and very much accustomed to researches of this nature. M. Abad took at random, in a fine field of wheat of several acres in extent, forty wheaten plants (*triticum hybernum*); he put the roots in water to clear them of all earth, and he found that every grain had produced forty, sixty, and even seventy stalks. The ears were almost all equally well furnished. The number of grains which they contained was reckoned, and it was found that this number frequently exceeded a hundred and even a hundred and twenty. The mean term appeared ninety. Some ears even contained a hundred and sixty grains. What an astonishing example of fertility! It is remarked, in general, that wheat divides enormously in the Mexican fields, that from a single grain a great number of stalks shoot up, and that each plant has extremely long and bushy roots. The Spanish colonists call this effect of the vigour of vegetation *el macollar del trigo*.

To the north of this very fertile district of Zelaya, Salamanca, and Leon, the country is arid in the extreme, without rivers, without springs, and presenting vast extents of crusts of hardened clay (*tepetate*), which the cultivators call *hard* and *cold* lands, and through which the roots of the herbaceous plants with difficulty penetrate. These beds of clay, which I also found in the kingdom of Quito, resemble at a distance banks of rock desti-

tute of every sort of vegetation. They belong to the *trappish formation*, and constantly accompany on the ridge of the Andes of Peru and Mexico the basaltes, the grünstein, the amygdaloid, and the amphibolic porphyry. But in other parts of New Spain, in the beautiful valley of Santiago, and to the south of the town of Valladolid, the decomposed basaltes and amygdaloids have formed in the succession of ages a black and very productive earth. The fertile fields which surround the Alberca of Santiago bring to mind the basaltic districts of the Mittelgebirge of Bohemia.

We have already described*, when treating of the particular statics of the country, the deserts without water which separate New Biscay from New Mexico. All the table-land which extends from Sombrerete to the Saltillo, and from thence towards la Punta de Lampazos, is a naked and arid plain, in which cactus and other prickly plants only vegetate! The sole vestige of cultivation is on some points, where, as around the town of the Saltillo, the industry of man has procured a little water for the watering of the fields. We have also traced a view of Old California†, of which the soil is a rock both destitute of earth and water. All these considerations concur to prove what we have advanced in the preceding book, that on account of its extreme dryness a

* Chap. VIII. † Ibid.

considerable part of New Spain situated to the north of the tropic is not susceptible of a great population. Hence what a remarkable contrast between the physiognomy of two neighbouring countries, between Mexico and the United States of North America! In the latter the soil is one vast forest, intersected by a great number of rivers, which flow into spacious gulfs; while Mexico presents from east to west a wooded shore, and in its centre an enormous mass of colossal mountains, on the ridge of which stretch out plains destitute of wood, and so much the more arid, as the temperature of the ambient air is augmented by the reverberation of the solar rays. In the north of New Spain, as in Thibet, Persia, and all the mountainous regions, a part of the country will never be adapted for the cultivation of cerealia till a concentrated and highly civilized population shall have vanquished the obstacles opposed by nature to the progress of rural economy. But this aridity, we repeat it, is not general; and it is compensated for by the extreme fertility observable in the southern countries, even in that part of the *provincias internas* in the neighbourhood of rivers, in the basins of the Rio del Norte, the Gila, the Hiaqui, the Mayo, the Culiacan, the Rio del Rosario, the Rio de Conchos, the Rio de Santander, the Tigre, and the numerous torrents of the province of Texas.

In the most northern extremity of the kingdom,

on the coast of New California, the produce of wheat is from 16 to 17 for 1, taking the mean term among the harvests of eighteen villages for two years. I believe that agriculturists will peruse with pleasure the detail of these harvests in a country situated under the same parallel as Algiers, Tunis, and Palestine, between the 32° 39′ and 37° 48′ of latitude.

Names of the villages of New California.	1791. Fanegas of wheat.		1802. Fanegas of wheat.		Harvest considered as multiple of the grain sown.	
	Sown.	Reaped.	Sown.	Reaped.	1791.	1802.
San Diego	60	3021	. .	. .	$50\frac{3}{10}$	
San Luis Rey de Francia	. .	. .	100	1200	. .	12
San Juan Capistrano	80	1586	103	2908	$19\frac{8}{10}$	$28\frac{2}{10}$
San Gabriel	178	3700	282	3800	$20\frac{7}{10}$	$13\frac{4}{10}$
San Fernando	. .	. .	100	2800	. .	28
San Buenaventura	44	259	96	3500	$5\frac{3}{10}$	$36\frac{4}{10}$
Santa Barbara	65	1500	113	2876	23	$25\frac{4}{10}$
La Purissima Concepcion	76	800	96	3500	$10\frac{5}{10}$	$36\frac{4}{10}$
San Luis Obispo	86	1078	161	4000	$12\frac{5}{10}$	$25\frac{4}{10}$
San Miguel	. .	. .	70	1600	. .	$22\frac{8}{10}$
Soledad	. .	. .	78	500	. .	$6\frac{4}{10}$
San Antonio de Padua	90	952	139	1200	$10\frac{6}{10}$	$8\frac{7}{10}$
San Carlos	71	221	60	240	$3\frac{1}{10}$	4
San Juan Bauptista	. .	. .	52	1200	. .	$23\frac{1}{10}$
Santa Cruz	. .	. .	60	550	. .	$9\frac{1}{10}$
Santa Clara	64	1400	129	2000	$21\frac{8}{10}$	$15\frac{5}{10}$
San Jose	. .	. .	84	1200	. .	$14\frac{3}{10}$
San Francisco	60	680	233	2322	$11\frac{3}{10}$	$9\frac{9}{10}$
	874	15,197	1956	35,396	$17\frac{4}{10}$	$17\frac{2}{10}$

It appears that the most northern part of this coast is less favourable to the cultivation of wheat than that which extends from San Diego to San Miguel. However, in newly cultivated grounds the produce of the soil is more inequal than in lands which have been long under cultivation, though we observe in no part of New Spain that progressive diminution of fertility which is so distressing to new colonists wherever forests have been converted into arable land.

Those who have seriously reflected on the riches of the Mexican soil know that by means of a more careful cultivation, and without supposing any extraordinary labour in the irrigation of the soil, the portion of ground already under cultivation might furnish subsistence for a population eight or ten times more numerous. If the fertile plains of Atlixco, Cholula, and Puebla, do not produce very abundant harvests, the principal cause ought to be sought for in the want of consumers, and in the obstacles opposed by the inequality of the soil to the interior commerce of grain, especially to its carriage towards the Atlantic coast. We shall afterwards return to this interesting subject when we come to treat of the exportation from Vera Cruz.

What is actually the produce of the grain harvest in the whole of New Spain? We can conceive how difficult must be the resolution of this problem in a country where the government, since the

death of the Count de Revillagigedo, has been very unfavourable to statistical researches. In France, even the estimations of Quesnay, Lavoisier, and Arthur Young, vary from forty-five and fifty to seventy-five millions of septiers of 117 kilogrammes in weight*. I have no positive data as to the quantity of rye and oats reaped in Mexico, but I conceive myself enabled to calculate approximately the mean produce of wheat. The most sure estimate in Europe is the computed consumption of each individual. This method was successfully employed by MM. Lavoisier and Arnould; but it is a method which cannot be followed in the case of a population composed of very heterogeneous elements. The Indian and Mestizoe, the inhabitants of the country, are only fed on maize and manioc bread. The white Creoles who live in great cities, consume much more wheaten bread than those who habitually live on their farms. The capital, which includes more than 33,000 Indians, requires annually 19 millions of kilogrammes of flour. This consumption is almost the same as that of the cities of Europe of an equal population; and if, according to this basis, we were to calculate the consumption of the whole kingdom of New Spain, we should attain to a result which would be five times too high.

* 11,620, 12,911, and 19,366 millions of pounds avoird. *Trans.*

From these considerations I prefer the method which is founded on partial estimations. The quantity of wheat reaped in 1802 in the intendancy of Guadalaxara was, according to the statistical table communicated by the intendant of this province to the chamber of commerce at Vera Cruz, 43,000 *cargas*, or 645,000 kilogrammes. Now the population of Guadalaxara is nearly a ninth of the total population. In this part of Mexico there is a great number of Indians who eat maize bread, and there are few populous cities inhabited by whites in easy circumstances. According to the analogy of this partial harvest, the general harvest of New Spain would only be 59 millions of kilogrammes. But if we add 36 millions of kilogrammes on account of the beneficial influence of the consumption of the cities* of

* Chap. VIII. Statistical Analysis, vol. II. p. 94 and 200. I formed from accurate materials in my possession the following table, in which the consumption in meal is compared with the number of inhabitants.

Cities.	Consumption Of meal.	Population.
	Kilogrammes.	
Mexico . .	19,100,000	137,000
Puebla . .	7,790,000	67,300
The Havanah .	5,230,000	80,000
Paris . . .	76,000,000	547,000

As to the consumption of Paris, see the curious researches of M. Peuchet in his *Statistique elementaire de la France*, p.

Mexico, Puebla, and Guanaxuato, on the cultivation of the circumjacent districts, and on account of the *provincias internas*, of which the inhabitants live almost exclusively on wheaten bread, we find for the whole kingdom nearly ten millions of myriagrammes*, or more than 800,000 setiers. This estimate gives too small a result, because in the above calculation we have not suitably separated the northern provinces from the equinoxial region. This separation is dictated, however, by the very nature of the population.

In the *provincias internas* the greatest number of the inhabitants are either white or reputed white; and they are calculated at 400,000. Supposing their consumption of wheat equal to that of the city of Puebla, we shall find six millions of myriagrammes. We may admit, calculating according to the annual harvest of the intendancy of Guadalaxara, that in the southern regions of New Spain, of which the mixed population is estimated at 5,437,000, the consumption of wheat in the country amounts to 5,800,000 myriagrammes. If we add 3,600,000 myriagrammes for the consumption of the great interior cities of Mexico, Puebla, and Guanaxuato, we shall find the total

372. The common people at the Havanah eat a great deal of cassava and arepa. The annual consumption of the Havanah is, on a mean term of four years, 427,018 arrobas or 58,899 *barriles* (*Papel periodico de la Havana*, 1801, n. 12. p. 46).

* Upwards of 220½ millions of pounds avoird. *Trans.*

consumption of New Spain above 15 millions of myriagrammes*, or 1,280,000 setiers of 240 pounds.

We might be astonished to find from this calculation that the *provincias internas*, of which the population is only a fourteenth of the whole population, consume more than the third of the harvest of Mexico. But we must not forget that in these northern provinces the number of whites is to the total mass of Spaniards, (Creoles, and Europeans,) as one to three †, and that it is principally this cast by which the wheaten flour is consumed. Of the 800,000 whites who inhabit the equinoxial region of New Spain, nearly 150,000 live in an excessively warm climate in the plains adjacent to the coast, and feed on manioc and bananas. These results, I repeat, are merely simple approximations; but it appeared to me so much the more interesting to publish them, as, during my stay in Mexico, they already fixed the attention of the government. We are sure of exciting the spirit of research when we advance a fact which interests the whole nation, and as to which calculations have never before been ventured.

* 331 millions of pounds avoird. *Trans.*

† In a former part of this work the number of whites in the provincias internas were stated as nearly a fourth of the whole white inhabitants. See note by the translator, vol. II. p. 356. on the difficulty of accounting for a million in the total estimate of inhabitants in New Spain. *Trans.*

In France the whole grain harvest, that is to say, wheat, rye, and barley, was, according to Lavoisier, before the revolution, and consequently at a period when the population of the kingdom amounted to 25 millions of inhabitants, 58 millions of setiers, or 6786 millions of kilogrammes. Now, according to the authors of the *Feuille du Cultivateur*, the wheat reaped in France is to the whole mass of grain as 5:17. Hence the produce of wheat alone was, previous to 1789, seventeen millions of setiers, which, taking merely absolute quantities, and without considering the populations of the two empires, is nearly 13 times more than the produce of wheat in Mexico. This comparison agrees very well with the bases of my anterior estimation. For the number of inhabitants of New Spain who habitually live on wheaten bread does not exceed 1,300,000; and it is well known that the French consume more bread than the Spanish race, especially those who inhabit America.

But on account of the extreme fertility of the soil, the fifteen millions of myriagrammes annually produced by New Spain are reaped on an extent of ground four or five times smaller than would be requisite for the same harvest in France. We may expect, it is true, as the Mexican population shall increase that this *fertility*, which may be called *medium*, and which indicates a total produce of 24 for 1, will decrease. Every where men begin with the cultivation of the least arid

lands, and the mean produce must naturally diminish when agriculture embraces a greater extent, and, consequently, a greater variety of ground. But in a vast empire like Mexico this effect can only be very tardy in its manifestation, and the industry of the inhabitants increases with the population and the number of increasing wants.

We shall collect into one table the knowledge which we have acquired as to the mean produce of the cerealia in the two continents. We are not here adducing examples of an extraordinary fertility observable in a small extent of ground, nor of grain sown according to the Chinese method. The produce would nearly be the same in every zone, if, in choosing our ground, we were to bestow the same care on cerealia which we bestow on our garden plants. But in treating of agriculture in general, we speak merely of extensive results, of calculations, in which the total harvest of a country is considered as the *multiple* of the quantity of wheat sown. It will be found that this multiple, which may be considered as one of the first elements of the prosperity of nations, varies in the following manner:

5 to 6 grains for one, in France, according to Lavoisier and Neckar. We estimate, with M. Peuchet, that 4,400,000 *arpens* sown with wheat yield annually 5280 millions of pounds, which

amounts to 1173 kilogrammes per hectare*. This is also the mean produce in the north of Germany, Poland, and, according to M. Rühs, in Sweden. They reckon in France in some remarkably fertile districts of the departments of l'Escaut and le Nord 15 for 1; in the good land of Picardy and the isle of France from 8 to 10 for 1; and in the lands of less fertility from 4 to 5 for one†.

8 to 10 grains for 1 in *Hungary*, *Croatia*, and *Sclavonia*, according to the researches of M. Swartner.

12 grains for one in the *Reyno de la Plata*, especially in the environs of Montevideo, according to Don Felix Azara. Near the city of Buenos Ayres they reckon even 16. In Paraguay the cultivation of cerealia does not extend farther north than the parallel of 24°.‡

17 grains for 1 in the *northern part of Mexico*, and at the same distance from the equator as Paraguay and Buenos Ayres.

24 grains for one *in the equinoxial region of Mexico*, at two or three thousand metres of elevation above the level of the ocean. They

* 2588lb. avoird. p. 107,639 square feet. An *arpent* is rather more than a demi-hectare. *Trans.*

† *Peuchet statistique*, p. 290.

‡ Voyage d'Azara, t. I. p. 140.

reckon 5000 kilogrammes per hectare*. In the province of Pasto of the kingdom of Santa Fe, through which I travelled in the month of November, 1801, the plains of la Vega de San Lorenzo, Pansitara, and Almaguer †, commonly produce 25, in very fertile years 35, and in cold and dry years 12 for 1. In Peru, in the beautiful plain of Caxamarca ‡, watered by the rivers Mascon and Utusco, and celebrated from the defeat of the Inca Atahualpa, wheat yields from 18 to 20 for 1.

The Mexican flour enters into competition at the Havanah market with that of the United States. When the road which is constructing from the table-land of Perote to Vera Cruz shall be completely finished, the grain of New Spain will be exported for Bordeaux, Hamburg, and Bremen. The Mexicans will then possess a double advantage over the inhabitants of the United States, that of a greater fertility of territory, and that of a lower price of labour. It would be very interesting in this point of view could we compare here the *mean produce* of the different provinces of the American confederation with the

* 11,035lb. avoird. p. 107,639 square feet. *Trans.*

† Lat. 1° 54′ north. Absolute height 2300 metres (7545 feet).

‡ Lat. 7° 8′ north. Absolute height 2860 metres (9382 feet).

results which we have obtained for Mexico. But the fertility of the soil and the industry of the inhabitants vary so much in different provinces, that it becomes difficult to find the mean term which corresponds to the total harvest. What a difference between the excellent cultivation of the environs of Lancaster and several parts of New England and that of North Carolina! "An English farmer," says the immortal Washington in one of his letters to Arthur Young, "ought to have a horrid idea of the state of our agriculture, or the nature of our soil, when he is informed that an *acre* with us only produces eight or ten *bushels*. But it must be kept in mind that in all countries where land is cheap and labour dear, men are fonder of cultivating much than cultivating well. Much ground has been scratched over, and none cultivated as it ought to have been*." According to the recent researches of M. Blodget, which may be regarded as sufficiently exact, we find the following results:

* This interesting letter was published in the Statistical Manual for the United States, 1806, p. 96. An acre contains 5368 square metres. A bushel of wheat weighs 30 kilogrammes. *Author.*

The square of a metre is 10.76397 feet, consequently 5368 square metres = 57780 square feet; but an acre contains only 43560 square feet. *Trans.*

In the Atlantic provinces to the east of the Alleghany mountains.	Per acre.	Per hectare *.
	Bushels.	Kilogrammes.
In rich lands	32	1788
In common lands . . .	9	503
In the western territory between the Alleghany and the Mississipi.		
In rich lands	40	2235
In common lands . . .	25	1397

We see from these data, that in the Mexican intendancies of Puebla and Guanaxuato, where on the ridge of the Cordillera the climate of Rome and Naples prevails, the territory is more rich and productive than the most fertile parts of the United States †.

As since the death of General Washington the progress of agriculture has been very considerable in the western territory, especially in Kentucky, Tennessee, and Louisiana, I believe we may consider from 13 to 14 *bushels* as the mean term of the annual produce, which, however, only amounts to 700 kilogrammes ‡ per hectare, or less than 4

* According to the proportion laid down by the author in the preceding note for converting bushels into kilogrammes, which is 1:30, and taking the acre at 43,560 square feet, and the hectare at 107,639 square feet, we shall find the numbers in this column 2372, 667, 2965, and 1853 kilogrammes. *Trans.*

† The comparative fertility, taking the highest of the American produce, is 5000 : 2965. *Trans.*

‡ 13 bushels amount to 963 and 14 to 1037 kilogrammes. Mean 1000. *Trans.*

for 1. In England the wheat harvest is generally estimated at from 19 to 20 *bushels* per acre, which gives 1100 kilogrammes per hectare *. This comparison, we have to repeat, does not announce a greater fertility of the soil of Great Britain. Far from giving us *a horrid idea* of the sterility of the Atlantic provinces of the United States, it proves only that whenever the colonist is master of a vast extent of ground, the art of cultivating the soil comes extremely slow to perfection. The memoirs of the Agricultural Society of Philadelphia furnish us with different examples of harvests exceeding 38 and 40 bushels per acre, whenever the fields have been laboured in Philadelphia with the same care as in Ireland and Flanders.

After comparing the mean produce of the lands in Mexico and Buenos Ayres with those in the United States and France, let us bestow a rapid glance at the price of labour in these different countries. In Mexico it amounts to two *reales de plata* † (50 sols) per day in the cold regions, and to two reals and a half‡ (3 livres 2 sols) per day in the warm regions, where there is a want of

* 19 bushels = 1408 and 20 = 1482. Mean 1445. *Trans.*

† See note, p. 231, where the author estimates the double piastre, or pezzo fuerte, at 8 reales de plata. The piastre being 5 livres 5 sous; the real is only 13 sous; consequently, 2 reals = 26 sous = 1*s.* 1*d.* *Trans.*

‡ Two reals and a half = 1 livre 12 sols, 6 den. = 1*s.* 4½*d.* *Trans.*

hands, and where the inhabitants in general are very lazy. This price of labour ought to appear moderate enough when we consider the metallic wealth of the country, and the quantity of money constantly in circulation. In the United States, where the whites have pushed the Indian population beyond the Ohio and the Mississipi, the price of labour varies from 3 livres 10 sols, to 4 francs*. In France we may estimate it from 30 to 40 sols†, and in Bengal, according to M. Titzing, at 6 sols‡. Hence, notwithstanding the enormous difference of freight, the East India sugar is cheaper at Philadelphia than that of Jamaica. From these data it follows, that the present price of labour in Mexico is to the price of labour

in France	= 10 : 6.
in the United States	= 10 : 13.
in Bengal	= 10 : 1‖.

The mean price of wheat is in New Spain from four to five piastres, or from 20 to 25 francs the *carga*, which weighs 150 kilogrammes§. This is the price at which it is purchased in the country, even from the farmers. At Paris, for several

* From 2*s.* 11*d* to 3*s.* 4*d.* *Trans.*

† From 1*s.* 3*d.* to 1*s.* 8*d.* *Trans.* ‡ 3*d.* *Trans.*

‖ The reader will observe that these proportions are erroneous. Taking Mexico as 10, France will be 12, the United States 26, and Bengal 2. *Trans.*

§ From 17*s.* 6*d.* to 21*s.* 10*d.* p. 331 lb. avoird. *Trans.*

years, 150 kilogrammes of wheat cost 30 francs. In the city of Mexico the high price of carriage adds so much to the price of the grain, that it generally sells there at 9 and 10 piastres the *carga**. The extremes, at the periods of the greatest or least fertility, are 8 and 14 piastres. It is easy to foresee that the price of Mexican grain will suffer a considerable fall when the roads shall be constructed on the declivity of the Cordilleras, and the progress of agriculture shall be favoured by greater commercial freedom.

The Mexican wheat is of the very best quality; and it may be compared with the finest Andalusian grain. It is superior to that of Monte Video, which, according to M. Azara, has the grain smaller by one half than the Spanish grain. In Mexico the grain is very large, very white, and very nutritive, especially in farms where watering is employed. It is observed that the wheat of the mountains (*trigo de Sierra*), that is to say, that which grows at very great elevations on the ridge of the Cordillera, has its grain covered with a thicker husk, while the grain of the temperate regions abounds in glutinous matter. The quality of the flour depends principally on the proportion which exists between the gluten and starch, and it appears natural that, under a climate favourable

* That is to say, from 1*l.* 17*s.* 6*d.* to 2*l.* 3*s.* 4*d.* p. 331 lb. avoird. *Trans.*

to the vegetation of gramina, the embryo and the cellular reticulation* of the albumen should become more voluminous.

In Mexico grain is with difficulty preserved for more than two or three years, especially in the temperate climates, and the causes of this phenomenon have never been sufficiently attended to. It would be advisable to establish magazines in the coldest parts of the country. We find, however, a prejudice spread through several parts of Spanish America, that the flour of the Cordillera does not preserve so long as the flour of the United States. The cause of this prejudice, which has been of particular detriment to the agriculture of New Grenada, is easily to be discovered. The merchants who inhabit the coasts opposite to the West Indies, and who find themselves constrained by commercial prohibitions, particularly the merchants of Carthagena for example, have the greatest interest in maintaining a connection with the United States. The custom-house officers are sometimes indulgent enough to take a Jamaica vessel for a vessel of the United States.

Rye, and especially barley, resist cold better than wheat. They are cultivated on the highest regions. Barley yields abundant harvests at heights where the thermometer rarely keeps up

* Mirbel sur la germination des graminées. *Annales du Museum d'Hist. Nat.* vol. xiii. p. 147.

during the day beyond 14 degrees*. In New California, taking the term of the harvests of 13 villages, the barley produced in 1791, 24, and in 1802, 18 for 1.

Oats are very little cultivated in Mexico. They are even very seldom seen in Spain, where the horses are fed on barley, as in the times of the Greeks and Romans. The rye and barley are seldom attacked by a disease called by the Mexicans *chaquistle*, which frequently destroys the finest wheat harvests when the spring and the beginning of the summer have been very warm, and when storms are frequent. It is generally believed that this disease is occasioned by small insects, which fill the interior of the stalk, and hinder the nutritive juice from mounting up to the ear.

A plant of a nutritive root, which belongs originally to America, the *potatoe (solanum tuberosum)*, appears to have been introduced into Mexico nearly at the same period as the cerealia of the old continent. I shall not take upon me to decide whether the *papas* (the old Peruvian name by which potatoes are now known in all the Spanish colonies) came to Mexico along with the schinus molle† of Peru, and consequently by the South Sea; or whether the first conquerors brought them

* 57° of Fahrenheit. *Trans.*

† Hernandez, lib. iii. c. 15. p. 54.

from the mountains of New Grenada. However this may be, it is certain that they were not known in the time of Montezuma; and this fact is the more important, because it is one of those in which the history of the migrations of a plant is connected with the history of the migrations of nations.

The predilections manifested by certain tribes for the cultivation of certain plants, indicates most frequently either an identity of race, or ancient communications between men who live under different climates. In this view the vegetables, like the languages and physiognomy of nations, may become historical monuments. Not merely pastoral tribes, or those who live solely on the chase, undertake long voyages, instigated by an unquiet and warlike spirit; the hordes of Germanic origin, the swarm of people who transported themselves from the interior of Asia to the banks of the Borysthenes and the Danube, and the savages of Guayana, afford numerous examples of tribes, who, fixing themselves for a few years, cultivate small pieces of ground, on which they sow the grain reaped by them elsewhere, and abandon these imperfect cultivations when a bad year, or any other accident, disgusts them with the situation. It is thus that the people of the Mongol race have transported themselves from the wall which separates China from Tartary to the very centre of Europe; and it is thus that, from the north of California and the banks of the Rio

Gila, the American tribes poured even into the southern hemisphere. We everywhere see torrents of wandering and warlike hordes pave a way for themselves through the midst of peaceable and agricultural nations. Immoveable as the shore, the latter collect and carefully preserve the nutritive plants and domestic animals which accompanied the wandering tribes in these distant courses. Frequently the cultivation of a small number of vegetables, as well as the foreign words mingled with languages of a different origin, serve to point out the route by which a nation has passed from one extremity of the continent to the other.

These considerations, which I have more fully developed in my *Essay on the Geography of Plants*, are sufficient to prove how important it is for the history of our species to know with precision how far the primitive dominion of certain vegetables extended before the spirit of colonization among the Europeans collected together the productions of the most distant climates. If the cerealia, if the rice * of the East Indies, were unknown to the first inhabitants of America, on the other hand, maize, the potatoe, and the quinoa, were neither cultivated in Eastern Asia, nor in the islands of the South Sea. Maize was intro-

* What is the wild rice of which Mackenzie speaks, a gramen which does not grow beyond the 50° of latitude, and on which the natives of Canada feed during winter? *Voyage de Mackenzie*, i. p. 156.

duced into Japan by the Chinese, who, according to the assertion of some authors, ought to have known it from the remotest period*. This assertion, if it was founded, would throw light on the ancient communications supposed to have taken place between the inhabitants of the two continents. But where are the monuments which attest that maize was cultivated in Asia before the sixteenth century? According to the learned researches of Father Gaubil†, it appears even doubtful whether, a thousand years before that period, the Chinese ever visited the western coast of America, as was advanced by a justly celebrated historian, M. de Guignes. We persist in believing that the maize was not transported from the table-land of Tartary to that of Mexico, and that it is equally improbable that, before the discovery of America by the Europeans, this precious gramen was transported from the new continent into Asia.

The potatoe presents us with another very curious problem, when we consider it in a historical point of view. It appears certain, as we have already advanced, that this plant, of which the

* *Thunberg, Flora Japonica*, p. 37. The maize is called in Japanese *Sjo Kuso*, and *Too kibbi*. The word *kuso* indicates a herbaceous plant, and the word *too* announces an exotic production.

† Astronomical MS. of the Jesuits preserved in the *Bureau des Longitudes* at Paris.

cultivation has had the greatest influence on the progress of population in Europe, was not known in Mexico before the arrival of the Spaniards. It was cultivated at this epoqua in Chili, Peru, Quito, in the kingdom of New Grenada, on all the Cordillera of the Andes, from the 40° of south latitude to the 50° of north latitude. It is supposed by botanists that it grows spontaneously in the mountainous part of Peru. On the other hand, the learned who have enquired into the introduction of potatoes into Europe, affirm that the potatoe was found in Virginia by the first settlers sent there by Sir Walter Raleigh in 1584. Now how can we conceive that a plant, said to belong originally to the southern hemisphere, was found under cultivation at the foot of the Alleghany mountains, while it was unknown in Mexico and the mountainous and temperate regions of the West Indies? Is it probable that Peruvian tribes may have penetrated northwards to the banks of the Rapahannoc in Virginia; or have potatoes first come from north to south, like the nations who from the 7th century have successively appeared on the table-land of Anahuac? In either of these hypotheses, how came this cultivation not to be introduced or preserved in Mexico? These are questions which have hitherto been very little agitated, but which, nevertheless, deserve to fix the attention of the naturalist, who, in embracing at one view the influence of man on nature, and the

re-action of the physical world on man, appears to read in the distribution of the vegetables the history of the first migrations of our species.

I have first to observe, stating here only what facts are to be relied on, that the potatoe is not indigenous in Peru, and that it is nowhere to be found wild in the part of the Cordilleras situated under the tropics. M. Bonpland and myself herborized on the back and on the declivity of the Andes from the 5° north, to the 12° south; we informed ourselves from persons who have examined this chain of colossal mountains as far as la Paz and Oruro, and we are certain that in this vast extent of ground no species of solanum with nutritive root vegetates spontaneously. It is true that there are places not very accessible, and very cold, which the natives call *Paramos de las Papas*, (desert potatoe-plains); but these denominations, of which it is difficult to conjecture the origin, by no means indicate that these great elevations produce the plant of which they bear the name.

Passing further southwards, beyond the tropic, we find it, according to Molina*, in all the fields of Chili. The natives distinguish the wild potatoe, of which the tubercles are small and somewhat bitter, from that which has been cultivated for a long series of ages. The first of these plants bears the name of *maglia*, and the second that of *pogny*.

* *Hist. Nat. du Chili*, p. 102.

Another species of solanum is also cultivated in Chili, which belongs to the same groupe, with pennated and not prickly leaves, and which has a very sweet root of a cylindrical form. This is the *solanum cari*, which is still unknown, not only in Europe, but also in Quito and Mexico.

We might ask if these useful plants are truly natives of Chili, or if, from the effect of a long cultivation, they have become wild there. The same question has been put to the travellers who have found cerealia growing spontaneously in the mountains of India and Caucasus. MM. Ruiz and Pavon, whose authority is of so great weight, affirm that they found the potatoe in cultivated grounds, *in cultis*, and not in forests, and on the ridges of the mountains. But we are to observe, that among us the solanum and the different kinds of grain do not propagate of themselves in a durable manner, when the birds transport the grains into meadows and woods. Wherever these plants appear to become wild under our eyes, far from multiplying like the erigeron Canadense, the oenothera biennis, and other colonists of the vegetable kingdom, they disappear in a very short space of time. Are not the *maglia* of Chili, the grain of the banks of the Terek*, and the wheat of the mountains (*hill-wheat*) of Boutan, which

* *Marschall de Biberstein, sur les bords occid. de la mer Caspienne*, 1798, p. 65 and 105.

M. Banks* has recently made known, more likely to be the primitive type of the solanum and cultivated cerealia?

It is probable that from the mountains of Chili the cultivation of potatoes gradually advanced northwards by Peru and the kingdom of Quito to the table-land of Bogota, the ancient Cundinamarca. This is also the course followed by the Incas in their conquests. We can easily conceive why long before the arrival of Manco Capac, in those remote times when the province of Collao and the plains of Tiahuanacu were the centre of the first civilization of mankind†, the migrations of the South American nations would rather be from south to north than in an opposite direction. Everywhere in the two hemispheres the people of the mountains have manifested a desire to approach the equator, or, at least, the torrid zone, which, at great elevations, affords the mildness of climate and the other advantages of the temperate zone. Following the direction of the Cordilleras, either from the banks of the Gila to the centre of Mexico, or from Chili to the beautiful vallies of Quito, the natives found in the same elevations, and without descending towards the plains, a more vigorous vegetation, less premature frosts, and less abundance of snow. The plains of Tiahuanacu

* *Bibl. Britt.* 1809, n. 322. p. 86.

† Pedro Cieca de Leon, c. 105. Garcilasso, iii. 1.

(lat. 17° 10′ south), covered with ruins of an august grandeur, and the banks of the lake of Chucuito, a basin which resembles a small interior sea, are the Himala and Thibet of South America. These men under the government of laws, and collected together on a soil of no great fertility, first applied themselves to agriculture. From this remarkable plain, situated between the cities of Cuzco and la Paz, descended numerous and powerful tribes, who carried their arms, language, and arts even to the northern hemisphere.

The vegetables, which were the object of the agriculture of the Andes, must have been carried northwards in two ways; either by the conquests of the Incas, who were followed by the establishment of Peruvian colonies in the conquered countries, or by the slow but peaceable communications which always take place between neighbouring nations. The sovereigns of Cuzco did not extend their conquests beyond the river of Mayo (lat. 1° 34′ north), of which the course is north from the town of Pasto. The potatoes which the Spaniards found under cultivation among the Muysca tribes in the kingdom of the zaque of Bogota (lat. 4° 6′ north), could only have been transported there from Peru by means of the relations which are gradually established even among mountainous tribes separated from one another by deserts covered with snow, or impassable vallies. The Cordilleras, which preserve a formidable

height from Chili to the province of Antioquia, fall suddenly near the sources of the great Rio Atracto. Choco and Darien present merely a groupe of hills which, in the isthmus of Panama, are only a few hundred toises in height. The cultivation of the potatoe succeeds well in the tropics only on very elevated grounds in a cold and foggy climate. The Indian of the warm regions gives the preference to maize, the manioc, and banana. Besides Choco, Darien, and the isthmus, covered with thick forests, have always been inhabited by hordes of savages and hunters, enemies to every sort of cultivation. We are not, therefore, to be astonished that both physical and moral causes have prevented the potatoe from penetrating into Mexico.

We know not a single fact by which the history of South America is connected with that of North America. In New Spain, as we have already several times observed, the flux of nations was from north to south. A great analogy of manners and civilization has been thought to be perceived* between the Toultecs driven by a pestilence from the table-land of Anahuac in the middle of the 12th century, and the Peruvians under the government of Manco Capac. It might, no

* I have discussed this curious hypothesis of the Chevalier Boturini in my Memoir on the first inhabitants of America (*Ueber die Urvöker*), *Neue Berlin Monatschreft*, 1806. p. 205.

doubt, have happened, that people from Aztlan advanced beyond the isthmus or gulf of Panama; but it is very improbable that by migrations from south to north the productions of Peru, Quito, and New Grenada, ever passed to Mexico and Canada.

From all these considerations it follows that if the colonists sent out by Raleigh really found potatoes among the Indians of Virginia, we can hardly refuse our assent to the idea that this plant was originally wild in some country of the northern hemisphere, as it was in Chili. The interesting researches carried on by MM. Beckman, Banks, and Dryander*, prove that vessels which returned from the bay of Albemarle in 1586 first carried potatoes into Ireland, and that Thomas Harriot, more celebrated as a mathematician than as a navigator, described this nutritive root by the name of *openawk*. Gerard, in his *Herbal*, published in 1597, calls it Virginian pa-

* *Beckmanns Grundsätze der Teutschen Landwirthschaft*, 1806, p. 289. *Sir Joseph Banks's attempt to ascertain the time of the introduction of potatoes*, 1808. The potatoe has been cultivated on a large scale in Lancashire since 1684; in Saxony since 1717; in Scotland since 1728; and in Prussia since 1738. *Author.*

It is believed that potatoes have only been cultivated extensively in Scotland since a much later period than 1728. The opinion generally received there is, that the cultivation began with the rebellion in 1745. *Trans.*

tatate, or *norembega*. We might be tempted to believe that the English colonists received it from Spanish America. Their establishment had been in existence from the month of July, 1584. The navigators of those times were not in the habit of steering straight westwards to reach the coast of North America; they were still in the practice of following the tract indicated by Columbus, and profiting by the trade winds of the torrid zone. This passage facilitated communication with the West India islands, which were the centre of the Spanish commerce. Sir Francis Drake, who had been navigating among these islands, and along the coast of Terra Firma, put in at Roanoke*, in Virginia. It appears then natural enough to suppose, that the English themselves brought potatoes from South America or from Mexico into Virginia. At the time when they were brought from Virginia into England they were common both in Spain and Italy. We are not then to be astonished that a production which had past from one continent to the other could in America pass from the Spanish to the English colonies. The very name by which Harriot describes the potatoe seems to prove its Virginian origin. Were the savages to have a word for a foreign plant,

* Roanoke and Albemarle, where Armidas and Barlow made their first establishment, now belong to the state of North Carolina. As to the colony of Raleigh consult *Marshall's Life of Washington*, vol. i. p. 12.

and would not Harriot have known the name *papâ?*

The plants which are cultivated in the highest and coldest part of the Andes and Mexican Cordilleras are the potatoe, the tropæolum esculentum*, and the chenopodium quinoa, of which the grain is an aliment equally agreeable and healthy. In New Spain the first of these becomes an object of cultivation, of so much greater importance from its extent, as it does not require any great humidity of soil. The Mexicans, like the Peruvians, can preserve potatoes for whole years by exposing them to the frost and drying them in the sun. The root, when hardened and deprived of its water, is called *chuno*, from a word of the Quichua language. It would be undoubtedly very useful to imitate this preparation in Europe, where a commencement of germination frequently destroys the winter's provisions; but it would be still of greater importance to procure the grain of the potatoes cultivated at Quito and on the plain of Santa Fe. I have seen them of a spherical form of more than three decimetres† (from twelve to thirteen inches) in diameter, and

* This new species of nasturtium, akin to the tropæolum peregrinum, is cultivated in the provinces of Popayan and Pasto on table-lands of three thousand metres of absolute elevation. It will be described in a work to be published by M. Bonpland and myself, under the title of *Nova genera et species plantarum equinoctialium.*

† 3 Decimetres = 11.8 inches.

of a much better taste than any in our continent. We know that certain herbaceous plants which have been long multiplied from the roots degenerate in the end, especially when the bad custom is followed of cutting the roots into several pieces. It has been proved by experience in several parts of Germany, that, of all the potatoes, those which grow from the seed are the most savoury. We may ameliorate the species by collecting the seed in its native country, and by choosing on the Cordillera of the Andes the varieties which are most recommendable from their volume and the savour of their roots. We have long possessed in Europe a potatoe which is known by agricultural writers under the name of red potatoe of Bedfordshire, and of which the tubercles weigh more than a kilogramme *; but this variety *(conglomerated potatoe)* is of an insipid taste, and can almost be applied only to feed cattle, while the *papa de chogota*, which contains less water, is very farinaceous, contains very little sugar, and is of an extremely agreeable taste.

Amongst the great number of useful productions which the migrations of nations and distant navigations have made known, no plant since the discovery of cerealia, that is to say from time immemorial, has had so decided an influence on the prosperity of mankind as the potatoe. This root,

* $2\frac{2}{10}$ lb. avoird. *Trans.*

according to the calculations of Sir John Sinclair, can maintain nine individuals per *acre* of 5368 square metres*. It has become common in New Zealand †, in Japan, in the island of Java, in the Boutan, and in Bengal, where, according to the testimony of M. Bockford, potatoes are considered as more useful than the bread-fruit tree introduced at Madras. Their cultivation extends from the extremity of Africa to Labrador, Iceland, and Lapland. It is a very interesting spectacle to see a plant descended from the mountains under the equator advance towards the pole, and resist better than the cereal gramina all the colds of the north.

We have successively examined the vegetable productions which are the basis of the food of the Mexican population, the *banana*, the *manioc*, the *maize*, and the *cerealia*; and we have endeavoured to throw some interest into this subject by comparing the agriculture of the equinoxial regions with that of the temperate climate of Europe, and by connecting the history of the migration of the vegetables with the events which

* It has been already observed that 5368 square metres = 57,780 square feet, and that an acre = 43,560 square feet. The Scotch acre, which is probably the one here used by Sir John Sinclair, is to the English as 10,000 : 7869, and contains 55,356 square feet.

† John Savage's Account of New Zealand, 1807, p. 16. *Trans.*

have brought the human race from one part of the globe to the other. Without entering into botanical details, which would be foreign to the principal aim of this work, we shall terminate this chapter by a succinct indication of the other alimentary plants which are cultivated in Mexico.

A great number of these plants has been introduced since the 16th century. The inhabitants of western Europe have deposited in America what they had been receiving for two thousand years by their communications with the Greeks and Romans, by the irruption of the hordes of central Asia, by the conquests of the Arabs, by the crusades, and by the navigations of the Portuguese. All these vegetable treasures accumulated in an extremity of the old continent by the continual flux of nations towards the west, and, preserved under the happy influence of a perpetually increasing civilization, have become almost at once the inheritance of Mexico and Peru. We see them afterwards augmented by the productions of America, pass farther still to the islands of the South Sea, and to the establishments which a powerful nation has formed on the coast of New Holland. In this way the smallest corner of the earth, if it become the domain of European colonists, and especially if it abounds with a great variety of climates, attests the activity which our species has been for centuries displaying. A colony collects in a small space every thing most

valuable which wandering man has discovered over the whole surface of the globe.

America is extremely rich in vegetables with nutritive roots. After the *manioc* and the *papas*, or potatoes, there are none more useful for the subsistence of the common people than the *oca* (*oxalis tuberosa*), the *batate*, and the *igname*. The first of these productions only grows in the cold and temperate climates, on the summit and declivity of the Cordilleras; and the two others belong to the warm region of Mexico. The Spanish historians, who have described the discovery of America, confound* the words *axes* and *batates*, though the one means a plant of the groupe of asparagus, and the other a convolvulus.

The *igname*, or *dioscorea alata*, like the banana, appears proper to all the equinoxial regions of the globe. The account of the voyage of Aloysio Cadamusto† informs us that this root was known by the Arabs. Its American name may even throw some light on a very important fact in the history of geographical discoveries, which never appears hitherto to have fixed the attention of the learned. Cadamusto relates, that the king of Portugal sent in 1500 a fleet of 12 vessels round the Cape of Good Hope to Calcutta, under the command

* *Gomara, libro* iii. c. 21.

† *Cadamusti navigatio ad terras incognitas* (Grynæus orb. Nov. p. 47).

of Pedro Aliares. This admiral, after having seen the Cape Verd islands, discovered a great unknown land, which he took for a continent. He found there naked men, swarthy, painted red, with very long hair, who plucked out their beards, pierced their chins, slept in hammocks, and were entirely ignorant of the use of metals. From these traits we easily recognize the natives of America. But what renders it extremely probable that Aliares either landed on the coast of Paria or on that of Guayana, is, that he said he found in cultivation there a species of millet (maize), and a root of which bread is made, *and which bears the name of igname.* Vespucci had heard the same word three years before pronounced by the inhabitants of the coast of Paria. The Haitian name of the dioscorea alata is *axes* or *ajes.* It is under this denomination that Columbus describes the *igname* in the account of his first voyage; and it is also that which it had in the times of Garcilasso, Acosta, and Oviedo*, who have very well indicated the characters by which the *axes* are distinguished from *batates.*

The first roots of the dioscorea were introduced into Portugal in 1596, from the small island of St. Thomas, situated near the coast of Africa, almost

* *Christophori Columbi navigatio*, c. lxxxix. *Comentarios Reales*, t. i. p. 278. *Historia natural de Indias*, p. 242. *Oviedo*, libro vii. c. 3.

under the equator *. A vessel which brought slaves to Lisbon had embarked these ignames to serve for food to the negroes in their passage. From similar circumstances several alimentary plants of Guinea have been introduced into the West Indies. They have been carefully propagated for the sake of furnishing the slaves with a diet to which they have been accustomed in their native country. It is observed that the melancholy of these unfortunate beings diminishes sensibly when they discover the plants familiar to them in their infancy.

In the warm regions of the Spanish colonies the inhabitants distinguish the *axe* from the *ñamas* of *Guinea*. The latter came from the coast of Africa to the West Indies, and the name of *igname* has gradually prevailed there over *axe*. These two plants are only, perhaps, varieties of the dioscorea alata, although *Brown* has endeavoured to elevate them to the rank of species, forgetting that the form of the leaves of the *ignames* undergoes a singular change by cultivation. We have nowhere discovered the plant called by Linnæus d. sativa †; neither does it exist in the islands of the

* *Clusii Rariorum Plantarum Hist.* lib. iv. p. lxxvii.

† Thunberg, however, affirms, that he saw it cultivated in Japan. There exists a great confusion in the dioscorean genus, and it is to be desired that a monography of it should be made. We brought with us a great number of new species,

South Sea, where the root of the d. alata, mixed with the white of cocoa-nuts and the pulp of the banana, is the favourite dish of the Otaheitans. The root of the igname acquires an enormous volume, when it grows in a fertile soil. In the valley of Aragua, in the province of Caraccas, we have seen it weigh from 25 to 30 kilogrammes *.

The *batates* go in Peru by the name of *apichu*, and in Mexico by that of *camotes*, which is a corruption of the Aztec word *cacamotic* †. Several varieties are cultivated with white and yellow roots; those of Queretaro, which grow in a climate analogous to that of Andalusia, are the most in request. I doubt very much if these *batates* were ever found wild by the Spanish navigators, though it has been advanced by Clusius. I have seen under cultivation in the colonies, besides the *convolvulus batatas*, the *c. platanifolius* of Vahl; nd I am inclined to believe that these two plants, the *umara* of Tahiti (*c. chrysorrhizus* of Solander ‡), and the c. *edulis* of Thunberg, which the Portuguese introduced into Japan, are varieties become constant, and descend from the same species. It would be so much the more interesting to know

which are partly described in the *Species Plantarum*, published by M. Willdenow, T. i. P. i. p. 794-796.

* From 55 to 66lb. avoird. *Trans.*

† The *cacamotic-tlanoquiloni*, or *cartlatlapan*, represented in *Hernandez*, c. liv. appears to be the convolvulus jalapa.

‡ *Forster Plantæ Esculentæ*, p. 56.

whether the batates cultivated in Peru, and those which Cook found in Easter Island (île de Pâques), are the same, as from the position of that island and the monuments which have been there discovered, several of the learned have been led to suspect the existence of ancient communications between the Peruvians and the inhabitants of the island discovered by Roggeween.

Gomara relates that Columbus, after his return to Spain, when he first made his appearance before Queen Isabella, brought to her grains of maize, igname roots, and *batatas*. Hence the cultivation of the last of these must have been already common in the southern part of Spain towards the middle of the 16th century. In 1591 they were even sold in the market of London *. It is generally believed that the celebrated Drake, or Sir John Hawkins, made them known in England, where they were long thought to be endowed with the mysterious properties for which the Greeks recommended the onions of Megara. The cultivation of *batatas* succeeds very well in the south of France. It requires less heat than the igname, which, otherwise, on account of the enormous mass of nutritive matter furnished by its roots, would be much preferable to the potatoe, if it could be successfully cultivated in countries of which the mean temperature is under 18 centigrade degrees†.

* *Clusius*, iii. c. 51. † 64° of Fahrenheit. *Trans.*

We must also reckon among the useful plants proper to Mexico the *cacomite*, or *oceloxochitl*, a species of tigridia, of which the root yielded a nutritive flour to the inhabitants of the valley of Mexico; the numerous varieties of love apples, or *tomatl* (*solanum lycopersicum*), which was formerly sown along with maize; the earth-pistachio, or *mani* * (arachis hypogea), of which the root is concealed in the earth, and which appears to have existed in Cochin China † long before the discovery of America; lastly, the different species of pimento (capsicum baccatum, c. annuum, and c. frutescens), called by the Mexicons *chilli*, and the Peruvians *uchu*, of which the fruit is as indispensably necessary to the natives as salt to the whites. The Spaniards call pimento *chile* or *avi* (ahi). The first word is derived from *quauh-chilli*, the second is a Haitian word that we must not confound with *axe*, which, as we have already observed, designates the dioscorea alata.

I do not remember to have ever seen cultivated in any part of the Spanish colonies the *topinambours* (*helianthus tuberosus*), which, according to M. Correa, are not even to be found in the Brazils,

* The word mani, like the greatest part of those given by the Spanish colonists to the plants under cultivation, is taken from the language of Haiti, which is now a dead language. In Peru the arachis was called *inchic*.

† *Loureiro Flora Cochinchinensis*, p. 522.

though in all our works on botany they are said to be natives of the country of the Brasilian Topinambas. The *chimdtail*, or sun with large flowers (helianthus annuus), came from Peru to New Spain. It was formerly sown in several parts of Spanish America, not only to extract oil from its seed, but also for the sake of roasting it and making it into a very nutritive bread.

Rice (oryza sativa) was unknown to the people of the new continent, as well as the inhabitants of the South Sea Islands. Whenever the old historians use the expression small Peruvian rice (*arroz pequeño*), they mean the *chenopodium quinoa*, which I found very common in Peru and the beautiful valley of Bogota. The cultivation of rice, introduced by the Arabs into Europe *, and by the Spaniards into America, is of very little importance in New Spain. The great drought which prevails in the interior of the country seems hostile to its cultivation. At Mexico they are not agreed as to the utility with which the introduction of the *mountain rice* might be attended, which is common to China, Japan, and known to all the Spaniards who have lived in the Philippine Islands. It is certain that the *mountain rice*, so much extolled of late, only grows on the slopes of hills, which

* The Greeks knew rice, but did not cultivate it. Aristobulus apud *Strab. lib.* xv., *pag. Casaub.* 1014—*Theophr.* lib. iv. c. 5—*Dioscor.* lib. ii. c. 116, *pag. Sarac.* 127.

are watered either by natural torrents or by canals of irrigation * cut at very great elevations. On the coast of Mexico, especially to the south-east of Vera Cruz, in the fertile and marshy grounds situated between the mouths of the rivers Alvarado and Goasacualco, the cultivation of the common rice may one day become as important as it has long been for the province of Guayaqui', for Louisiana, and the southern part of the United States.

It is so much the more to be desired that this branch of agriculture should be followed with ardour, as from the great droughts and premature frosts the grain and maize harvests frequently fail in the mountainous region, and the Mexican people suffer periodically from the fatal effects of a general famine. The rice contains a great deal of alimentary substance in a very small volume. In Bengal, where 40 kilogrammes may be purchased for three francs †, the daily consumption of a family of five individuals consists of two kilogrammes of rice, two of pease ‡, and two ounces

* Crescit oryza Japonica in collibus et montibus *artificio singulari*. *Thunberg, Flora Japon.* p. 147. M. Titzing, who lived long in Japan, and who is preparing an interesting description of his travels, also affirms that the *mountain rice* is watered, but that it requires less water than the rice of the plains.

† 88lb. avoird. for 2*s.* 6*d.* *Trans.*

‡ 4 4/10 lb. rice and 4 1/2 lb. pease. *Trans.*

of salt *. The frugality of the indigenous Aztec is almost equal to that of the Hindoo; and the frequent scarcities in Mexico might be avoided by multiplying the objects of cultivation, and directing the industry to vegetable productions easier to be preserved and transported than maize and farinaceous roots. Besides, and I advance this without encroaching on the famous problem of the population of China, it does not appear doubtful that ground cultivated with rice maintains a much greater number of families than the same extent under wheat cultivation. At Louisiana, in the basin of the Mississippi †, they compute that an acre of land commonly produces in *rice* 18 barrels, in *wheat* and *oats* 8, in *maize* 20, and in *potatoes* 26. In Virginia they reckon, according to M. Blodget, that an acre yields from 20 to 30 *bushels* of rice, while wheat only yields from 15 to 16. I am aware, that in Europe rice grounds are considered very pernicious to the health of the inhabitants; but the long experience of eastern Asia seems to prove that the effect is not the same in every climate. However this may be, there is little room to fear that the irrigation of the rice grounds will add to the insalubrity of a country already filled with marshes and *paletuviers* (rhizo-

* *Bockford's Indian Recreations. Calcutta*, 1807, p. 18.

† *MS. note on the value of land in Louisiana*, communicated to me by General Wilkinson.

phora mangle), which forms a true delta between the rivers Alvarado, San Juan, and Goasacualco.

The Mexicans now possess all the garden-stuffs and fruit-trees of Europe. It is not easy to indicate which of the former existed in the new continent before the arrival of the Spaniards. The same uncertainty prevails among botanists as to the species of turnips, salads, and cabbage cultivated by the Greeks and Romans. We know with certainty that the Americans were always acquainted with onions (in Mexican *xonacatl*), haricots (in Mexican, *ayacötli*, in the Peruvian or Quichua language *purutu*), gourds, (in Peruvian *capallu*), and several varieties of cicer. Cortez *, speaking of the eatables which were daily sold in the market of the ancient Tenochtitlan, expressly says, that every kind of garden-stuff (*legume*) was to be found there, particularly onions, leeks, garlic, garden and water-cresses (*mastuerzo y berro*), borrage, sorrel, and artichokes (*cardo y tagarninas*). It appears that no species of cabbage or turnip (brassica et raphanus) was cultivated in America, although the indigenous are very fond

* Lorenzana, p. 103; *Garcilasso*, p. 278 and 336; *Acosta*, p. 245. Onions were unknown in Peru, and the *chochos* of America were not the garavanzos (cicer arietinum). I know not whether the famous *frisolitos* of Vera Cruz, which have become an object of exportation, descend from a *phaseolus* of Spain, or whether they are a variety of the Mexican *ayacotli*.

of dressed herbs. They mixed together all sorts of leaves, and even flowers, and they called this dish *iraca*. It appears that the Mexicans had originally no pease; and this fact is so much the more remarkable, as our *pisum sativum* is believed to grow wild on the north-west coast of America *.

In general, if we consider the garden-stuffs of the Aztecs, and the great number of farinaceous roots cultivated in Mexico and Peru, we see that America was by no means so poor in alimentary plants as has been advanced by some learned men from a false spirit of system, who were only acquainted with the new world through the works of Herrera and Solis. The degree of civilization of a people has no relation with the variety of productions which are the objects of its agriculture or gardening. This variety is greater or less as the communications between remote regions have been more or less frequent, or as nations separated from the rest of the human race in very distant periods have been in a situation of greater or less insulation. We must not be astonished at not finding among the Mexicans of the 16th century the vegetable stores now contained in our gardens. The Greeks and Romans even neither knew spinach nor cauli-

* In the Queen Charlotte Islands, and in Norfolk or Tchinkitané Bay.—*Voyage de Marchand*, tom. i. p. 226 and 360. Were these pease not sown there by some European navigator? We know that cabbages have lately become wild in New Zealand.

flowers, nor scorzoneras, nor artichokes, nor a great number of other kitchen vegetables.

The central table-land of New Spain produces in the greatest abundance cherries, prunes, peaches, apricots, figs, grapes, melons, apples, and pears. In the environs of Mexico, the villages of San Augustin de las Cuevas and Tacubaya, the famous garden of the convent of Carmelites, at San Angel, and that of the family of Fagoaga, at Tanepantla, yield in the months of June, July, and August an immense quantity of fruit, for the most part of an exquisite taste, although the trees are in general very ill taken care of. The traveller is astonished to see in Mexico, Peru, and New Grenada, the tables of the wealthy inhabitants loaded at once with the fruits of temperate Europe, ananas *, different species of *passiflora* and tacsonia, sapotes, mameis, goyavas, anonas, chilimoyas, and other valuable productions of the torrid zone. This variety of fruits is to be found in almost all the country from Guatimala to New California. In studying the history of the conquest, we admire

* The Spaniards, in their first navigations, were in the custom of embarking ananas, which, when the passage was short, were eaten in Spain. They were presented to Charles the Fifth, who thought the fruit very beautiful, but would not taste them. We found the anana growing wild, and of the most exquisite flavour, at the foot of the great mountain of Duida, on the banks of the Alto Orinoco. The seed does not always miscarry. In 1594 the ananas was cultivated in China, where it had come from Peru.—*Kircher China illustrata*, p. 188.

the extraordinary rapidity with which the Spaniards of the 16th century spread the cultivation of the European vegetables along the ridge of the Cordilleras, from one extremity of the continent to the other. The ecclesiastics, and especially the religious missionaries, contributed greatly to the rapidity of this progress. The gardens of the convents and of the secular priests were so many nurseries, from which the recently imported vegetables were diffused over the country. The *conquistadores* even, all of whom we ought by no means to regard as warlike barbarians, addicted themselves in their old age to a rural life. These simple men, surrounded by Indians, of whose language they were ignorant, cultivated in preference, as if to console them in their solitude, the plants which recalled to them the plains of Estramadura and the Castilles. The epoqua at which an European fruit ripened for the first time was distinguished by a family festival. It is impossible to read without being warmly affected what is related by the inca Garcilasso as to the manner of living of these first colonists. He relates, with an exquisite naiveté, how his father, the valorous *Andres de la Vega*, collected together all his old companions in arms to share with them three asparaguses, the first which ever grew on the table-land of Cuzco.

Before the arrival of the Spaniards, Mexico and the Cordilleras of South America produced several fruits, which bear great analogy to those of the temperate climates of the old continent. The

physiognomy of vegetables bears always a great mutual resemblance where the temperature and humidity are the same. The mountainous part of South America has a cherry (padus capuli), nut, apple, mulberry, strawberry, rubus, and gooseberry, which are peculiar to it, and which will be made known by M. Bonpland and myself in the botanical part of our travels. Cortez relates that he saw, on his arrival at Mexico, besides the indigenous cherries, which are very acid, prunes, *ciruelas*. He adds, that they entirely resemble those of Spain. I doubt the existence of these Mexican prunes, although the Abbe Clavigero also mentions them. Perhaps the first Spaniards took the fruit of the *spondias*, which is a drupa ovoide, for European prunes.

Although the western coast of New Spain be washed by the Great Ocean, and although Mendaña, Gaetano, Quiros, and other Spanish navigators were the first who visited the islands situated between America and Asia, the most useful productions of these countries, the bread-fruit, the flax of New Zealand (phormium tenax), and the sugar-cane of Otaheite, remained unknown to the inhabitants of Mexico. These vegetables, after travelling round the globe, will reach them gradually from the West India islands. They were left by Captain Bligh at Jamaica, and they have propagated rapidly in the island of Cuba, Trinidad, and on the coast of Caraccas. The bread-fruit

(artocarpus incisa), of which I have seen considerable plantations in Spanish Guayana, would vegetate vigorously on the humid and warm coasts of Tabasco, Tustla, and San Blas. It is very improbable that this cultivation will ever supersede among the natives that of bananas, which, on the same extent of ground, furnish more nutritive substance. It is true that the artocarpus, for eight months in the year, is continually loaded with fruits, and that three trees are sufficient to nourish an adult individual *. But an arpent, or demi hectare of ground, can only contain from 35 to 40 bread-fruit trees †; for when they are planted too near one another, and when their roots meet, they do not bear so great a quantity of fruit.

The extreme slowness of the passage from the Philippine Islands and Mariana to Acapulco, and the necessity in which the Manilla galeons are under of ascending to higher latitudes to get the north-west winds, render the introduction of vegetables from oriental Asia extremely difficult. Hence, on the western coast of Mexico we find no plant of China or the Philippine Islands, except the *triphasia aurantiola (limonia trifoliata)*, an elegant shrub, of which the fruits are dressed, and which, according to Loureiro, is identical with the citrus trifoliata, or *kara-*

* *Georg Forster vom Brodbaume*, 1784, s. xxiii.

† See what has been already said on the comparative produce of banana, wheat, and potatoes, in a preceding part of this chapter.

tats-hanna of Kämpfer. As to the orange and citron trees, which in the south of Europe support, without any bad consequences, a cold for five or six days below 0 *, they are now cultivated throughout all New Spain, even on the central table-land. It has frequently been discussed, if these trees existed in the Spanish colonies before the discovery of America, or if they were introduced by the Europeans from the Canary Islands, the island of St. Thomas, or the coast of Africa. It is certain that there is an orange-tree, of a small and bitter fruit, and a very prickly citron, yielding a green, round fruit, with a singularly oily bark, which is frequently hardly of the size of a large nut, growing wild in the island of Cuba and on the coast of Terra Firma. But notwithstanding all my researches, I could never discover a single individual in the interior of the forests of Guayana, between the Orinoco, the Cassiquiare, and the frontiers of Brazil. Perhaps the small green citron *(limoncito verde)* was anciently cultivated by the natives; and perhaps it has only grown wild when the population, and consequently the extent of cultivated territory, were most considerable. I am inclined to believe that only the citron-tree, with large yellow fruit *(limon sutil)*, and the sweet orange, were introduced by the Portugueze and Spaniards †. We only saw them

* 32° of Fahrenheit. *Trans.* † Oviedo, lib. viii. c. 1.

on the banks of the Orinoco, where the Jesuits had established their missions. The orange, on the discovery of America, had only existed for a few centuries even in Europe. If there had been any ancient communication between the new continent and the islands of the South Sea, the true *citrus aurantium* might have arrived in Peru or Mexico by the way of the west; for this tree was found by M. Forster in the Hebrides islands, where it was seen by Quiros long before him*.

The great analogy between the climate of the table-land of New Spain and that of Italy, Greece, and the south of France, ought to invite the Mexicans to the cultivation of the olive. This cultivation was successfully attempted at the beginning of the conquest, but the government, from an unjust policy, far from favouring, endeavoured rather indirectly to frustrate it. As far as I know there exists no formal prohibition; but the colonists have never ventured on a branch of national industry which would have immediately excited the jealousy of the mother country. The court of Madrid has always seen with an unfavourable eye the cultiva-

* *Plantæ esculentæ Insularum australium*, p. 35. The common orange of the South Sea is the citrus decumana. The *garcinia mangostana*, of which the innumerable varieties are cultivated with so much care in the East Indies and in the Archipelago of the Asiatic Seas, is very much diffused within these ten years in the West India islands. It did not exist, however, in my time in Mexico.

tion of the olive and the mulberry, hemp, flax, and the vine, in the new continent: and if the commerce of wines and indigenous oils has been tolerated in Peru and Chili, it is only because those colonies, situated beyond Cape Horn, are frequently ill provisioned from Europe, and the effect of vexatious measures is dreaded in provinces so remote. A system of the most odious prohibitions has been obstinately followed in all the colonies of which the coast is washed by the Atlantic Ocean. During my stay at Mexico the viceroy received orders from the court to pull up the vines (*arancar las cepas*) in the northern provinces of Mexico, because the merchants of Cadiz complained of a diminution in the consumption of Spanish wines. Happily this order, like many others given by the ministers, was never executed. It was judged that, notwithstanding the extreme patience of the Mexican people, it might be dangerous to drive them to despair by laying waste their properties and forcing them to purchase from the monopolists of Europe what the bounty of nature produces on the Mexican soil.

The olive-tree is very rare in all New Spain; and there exists but a single olive plantation, the beautiful one of the Archbishop of Mexico, situated two leagues south-east from the capital. This *olivar del Arzobispo* annually produces 200 arrobas (nearly 2500 kilogrammes *) of an oil of a

* 5,500 lb. avoird. *Trans.*

very good quality. We have already spoken of the olive cultivated by the missionaries of New California, especially near the village of San Diego. The Mexican, when at complete liberty in the cultivation of his soil, will in time dispense with the oil, wine, hemp, and flax of Europe. The Andalusian olive introduced by Cortez sometimes suffers from the cold of the central table-land; for although the frosts are not strong, they are frequent and of long duration. It might be useful to plant the Corsican olive in Mexico, which is more than any other calculated to resist the severity of the climate.

In terminating the list of alimentary plants, we shall give a rapid survey of the plants which furnish beverages to the Mexicans. We shall see that in this point of view the history of the Aztec agriculture presents us with a trait so much the more curious, as we find nothing analogous among a great number of nations much more advanced in civilization than the ancient inhabitants of Anahuac.

There hardly exists a tribe of savages on the face of the earth who cannot prepare some kind of beverage from the vegetable kingdom. The miserable hordes who wander in the forests of Guayana make as agreeable emulsions from the different palm-tree fruits as the barley water prepared in Europe. The inhabitants of Easter Island, exiled on a mass of arid rocks without

springs, besides the sea water drink the juice of the sugar-cane. The most part of civilized nations draw their drinks from the same plants which constitute the basis of their nourishment, and of which the roots or seeds contain the sugary principle united with the amylaceous substance. Rice in southern and eastern Asia, in Africa the igname root with a few arums, and in the north of Europe cerealia, furnish fermented liquors. There are few nations who cultivate certain plants merely with a view to prepare beverages from them. The old continent affords us no instance of vine plantations but to the west of the Indus. In the better days of Greece this cultivation was even confined to the countries situated between the Oxus and Euphrates, to Asia Minor and western Europe. On the rest of the globe nature produces species of wild vitis; but nowhere else did man endeavour to collect them round him to ameliorate them by cultivation.

But in the new continent we have the example of a people who not only extracted liquors from the amylaceous and sugary substance of the *maize*, the *manioc*, and *bananas*, or from the pulp of several species of *mimosa*, but who cultivated expressly a plant of the family of the ananas, to convert its juice into a spirituous liquor. On the interior table-land, in the intendancy of Puebla, and in that of Mexico, we run over vast extents of country, where the eye reposes only on fields planted with

pittes or *maguey*. This plant, of a coriaceous and prickly leaf, which with the *cactus opuntia* has become wild since the sixteenth century throughout all the south of Europe, the Canary Islands, and the coast of Africa, gives a particular character to the Mexican landscape. What a contrast of vegetable forms between a field of grain, a plantation of agave, and a groupe of bananas, of which the glossy leaves are constantly of a tender and delicate green! Under every zone, man, by multiplying certain vegetable productions, modifies at will the aspect of the country under cultivation.

In the Spanish colonies there are several species of *maguey* which deserve a careful examination, and of which several, on account of the division of their corolla, the length of their stamina, and the form of their stigmata, appear to belong to different genus! The *maguey* or *metl* cultivated in Mexico are numerous varieties of the *agave Americana*, which has become so common in our gardens, with yellow fasciculated and straight leaves, and stamina twice as long as the pinking of the corolla. We must not confound this *metl* with the *agave cubensis* * of Jacquin (floribus ex albo virentibus, longe paniculatis, pendulis, staminibus corolla du-

* In the provinces of Caraccas and Cumana the agave cubensis (a. odorata Persoon) is called *maguey de Cocuy*. I have seen stocks (hampes) loaded with flowers from 12 to 14 metres in height (from 38 to 45 English feet). At Caraccas the *agave Americana* is called *maguey de Cocuiza*.

plo brevioribus), called by M. Lamarck a. Mexicana, and which has been believed by some botanists, for what reason I know not, the principal object of the Mexican cultivation.

The plantations of the *maguey de pulque* extend as far as the Aztec language. The people of the Otomite, Totonac, and Mistec race, are not addicted to the *octli*, which the Spaniards call *pulque*. On the central plain we hardly find the maguey cultivated to the north of Salamanca. The finest cultivations which I have had occa ion to see are in the valley of Toluca and on the plains of Cholula. The agaves are there planted in rows at a distance of 15 dec metres * from one another. The plants only begin to yield the juice which goes by the name of *honey*, on account of the sugary principle with which it abounds, when the *hampe* is on the point of its development. It is on this account of the greatest importance for the cultivator to know exactly the period of efflorescence. Its proximity is announced by the direction of the radical leaves, which are observed by the Indians with much attention. These leaves, which are till then inclined towards the earth, rise all of a sudden; and they endeavour to form a junction to cover the *hampe* which is on the point of formation. The bundle of central leaves (*cl. co-*

* 58 inches. *Trans.*

razon) becomes at the same time of a clearer green, and lengthens perceptibly. I have been informed by the Indians that it is difficult to be deceived in these signs, but that there are others of no less importance which cannot be precisely described, because they have merely a reference to the carriage of the plant. The cultivator goes daily through his agave plantations to mark those plants which approach efflorescence. If he has any doubt, he applies to the *experts* of the village, old Indians, who, from long experience, have a judgment or rather tact more securely to be relied on.

Near Cholula, and between Toluca and Cacanumacan, a maguey of eight years old gives already signs of the development of its *hampe*. They then begin to collect the juice, of which the *pulque* is made. They cut the *corazon*, or bundle of central leaves, and enlarge insensibly the wound, and cover it with lateral leaves, which they raise up by drawing them close, and tying them to the extremities. In this wound the vessels appear to deposit all the juice which would have formed the colossal *hampe* loaded with flowers. This is a true vegetable spring, which keeps running for two or three months, and from which the Indian draws three or four times a day. We may judge of the quickness or slowness of the motion of the juice by the quantity of *honey* extracted from the *maguey* at different times of the day.

A foot commonly yields, in twenty-four hours, four cubic decimetres, or 200 cubic inches*, equal to eight *quartillos*. Of this total quantity they obtain three *quartillos* at sun-rise, two at midday, and three at six in the evening. A very vigorous plant sometimes yields 15 quartillos, or 375 cubic inches† per day, for from four to five months, which amounts to the enormous volume of more than 1100 cubic decimetres‡. This abundance of juice produced by a *maguey* of scarcely a metre and a half in height‖ is so much the more astonishing, as the agave plantations are in the most arid grounds, and frequently on banks of rocks hardly covered with vegetable earth. The value of a maguey plant near its efflorescence is at Pachuca five piastres§, or 25 francs. In a barren soil the Indian calculates the produce of each maguey at 150 bottles, and the value of the pulque furnished in a day at from 10 to 12 sols. The produce is unequal, like that of the vine, which varies very much in its quantity of grapes. I have already mentioned the case of an Indian woman of Cholula who bequeathed to her children maguey plantations valued at 70 or 80 thousand piastres.

The cultivation of the agave has real advantages

* 242 cubic inches English. *Trans.*

† 454 cubic inches. *Trans.*

‡ 67,130 cubic inches. *Trans.*

‖ $4\frac{9}{10}$ feet. *Trans.* § 5 piastres = 1l. 2s. 4d. *Trans.*

over the cultivation of maize, grain, and potatoes. This plant, with firm and vigorous leaves, is neither affected by drought nor hail, nor the excessive cold which prevails in winter on the higher Cordilleras of Mexico. The stalk perishes after efflorescence. If we deprive it of the central leaves, it withers, after the juice which nature appears to have destined to the increase of the hampe is entirely exhausted. An infinity of shoots then spring from the root of the decayed plant; for no plant multiplies with greater facility. An arpent of ground contains from 12 to 13 hundred *maguey* plants. If the field is of old cultivation, we may calculate that a twelfth or fourteenth of these plants yields *honey* annually. A proprietor who plants from 30 to 40,000 maguey is sure to establish the fortune of his children; but it requires patience and courage to follow a species of cultivation which only begins to grow lucrative at the end of fifteen years. In a good soil the agave enters on its efflorescence at the end of five years; and in a poor soil no harvest can be expected in less than 18 years. Although the rapidity of the vegetation is of the utmost consequence for the Mexican cultivators, they never attempt artificially to accelerate the development of the *hampe* by mutilating the roots or watering them with warm water. It has been discovered that by these means, which weaken the plant, the confluence of juice towards the centre is sensibly diminished. A

maguey plant is destroyed if, misled by false appearances, the Indian makes the incision long before the flowers would have naturally developed themselves.

The *honey* or juice of the agave is of a very agreeable sour taste. It easily ferments, on account of the sugar and mucilage which it contains. To accelerate this fermentation they add, however, a little old and acid *pulque*. The operation is terminated in three or four days. The vinous beverage, which resembles cyder, has an odour of putrid meat extremely disagreeable; but the Europeans who have been able to get over the aversion which this fetid odour inspires, prefer the *pulque* to every other liquor. They consider it as stomachic, strengthening, and especially as very nutritive; and it is recommended to lean persons. I have seen whites who, like the Mexican Indians, totally abstained from water, beer, and wine, and drunk no other liquor than the juice of the agave. The connoisseurs speak with enthusiasm of the *pulque* prepared in the village of Hocotitlan, situated to the north of Toluca, at the foot of a mountain almost as elevated as the *Nevado* of this name. They affirm that the excellent quality of this pulque does not altogether depend on the art with which the liquor is prepared, but also on a taste of the soil communicated to the juice according to the fields in which the plant is cultivated. There are plantations of ma-

guey near Hocotitlan (*haciendas de pulque*) which bring in annually more than 40,000 livres *. The inhabitants of the country differ very much in their opinions as to the true cause of the fetid odour of the pulque. It is generally affirmed that this odour, which is analogous to that of animal matter, is to be ascribed to the skins in which the first juice of the agave is poured. But several well informed individuals pretend that the pulque when prepared in vessels has the same odour, and that if it is not found in that of Toluca, it is because the great cold there modifies the process of fermentation. I only knew of this opinion at the period of my departure from Mexico, so that I have to regret that I could not clear up by direct experiments this curious point in vegetable chemistry. Perhaps this odour proceeds from the decomposition of a vegeto-animal matter, analogous to the gluten, contained in the juice of the agave.

The cultivation of the maguey is an object of such importance for the revenue, that the entry duties paid in the three cities of Mexico, Toluca, and Puebla, amounted, in 1793, to the sum of 817,739 piastres †. The expenses of perception were then 56,608 piastres ‡; so that the government drew from the agave juice a nett revenue of

* 1666l. sterling. *Trans.*

† 178,890l. sterling. *Trans.* ‡ 12,383l. sterling.

761,131 piastres *, or more than 3,800,000 francs. The desire of increasing the revenues of the crown occasioned latterly a heavy tax on the fabrication of pulque, equally vexatious and inconsiderate. It is time to change the system in this respect, otherwise it is to be presumed that this cultivation, one of the most ancient and lucrative, will insensibly decline, notwithstanding the decided predilection of the people for the fermented juice of the agave.

A very intoxicating brandy is formed from the pulque, which is called *mexical*, or *aguardiente de maguey*. I have been assured that the plant cultivated for distillation differs essentially from the common maguey, or *maguey de pulque*. It appeared to me smaller, and to have the leaves not so glaucous; but not having seen it in flower I cannot judge of the difference between the two species. The sugar-cane has also a particular variety, with a violet stalk, which came from the coast of Africa (*caña de Guinea*), and which is preferred in the province of Caraccas for the fabrication of rum to the sugar-cane of Otaheite. The Spanish government, and particularly the *real hacienda*, has been long very severe against the *mexical*, which is strictly prohibited, because the use of it is prejudicial to the Spanish brandy trade. An enormous quantity, however, of this maguey

* 166,497l. *Trans.*

brandy is manufactured in the intendancies of Valladolid, Mexico, and Durango, especially in the new kingdom of Leon. We may judge of the value of this illicit traffic by considering the disproportion between the population of Mexico and the annual importation of European brandy into Vera Cruz. The whole importation only amounts to 32,000 barrels! In several parts of the kingdom, for example in the *provincias internas* and the district of Tuxpan, belonging to the intendancy of Guadalaxara, for some time past the *mexical* has been publicly sold on payment of a small duty. This measure, which ought to be general, has been both profitable to the revenue, and has put an end to the complaints of the inhabitants.

But the maguey is not only the vine of the Aztecs, it can also supply the place of the hemp of Asia, and the papyrus (cyperus papyrus) of the Egyptians. The paper on which the ancient Mexicans painted their hieroglyphical figures was made of the fibres of agave leaves, macerated in water, and disposed in layers like the fibres of the Egyptian cyperus, and the mulberry (*broussonetia*) of the South Sea islands. I brought with me several fragments of Aztec manuscripts * written on maguey paper, of a thickness so different that some of them resemble pasteboard, while

* See chap. vi. vol. i. p. 160.

others resemble Chinese paper. These fragments are so much the more interesting as the only hieroglyphics which exist at Vienna, Rome, and Veletri, are on Mexican stag skins. The thread which is obtained from the maguey is known in Europe by the name of pite thread, and it is preferred by naturalists to every other, because it is less subject to twist. It does not, however, resist so well as that prepared from the fibres of the phormium. The juice (*xugo de cocuyza*) which the agave yields when it is still far from the period of efflorescence is very acrid, and is successfully employed as a caustic in the cleaning of wounds. The prickles which terminate the leaves served formerly like those of the cactus, for pins and nails to the Indians. The Mexican priests pierced their arms and breast with them in their acts of expiation analogous to those of the buddists of Hindostan.

We may conclude from all that we have related respecting the use of the different parts of the maguey, that next to the maize and potatoe, this plant is the most useful of all the productions with which nature has supplied the mountaineers of equinoxial America.

When the fetters which the government has hitherto put on several branches of the national industry shall be removed, when the Mexican agriculture shall be no longer restrained by a system of administration which, while it impover-

ishes the colonies, does not enrich the mother country, the maguey plantations will be gradually succeeded by vineyards. The cultivation of the vine will augment with the number of the whites, who consume a great quantity of the wines of Spain, France, Madeira, and the Canary Islands. But in the present state of things, the vine can hardly be included in the territorial riches of Mexico, the harvest of it being so inconsiderable. The grape of the best quality is that of Zapotitlan, in the intendancy of Oaxaca. There are also vineyards near Dolores and San Luis de la Paz to the north of Guanaxuato, and in the provincias internas near Parras, and the Passo del Norte. The wine of the Passo is in great estimation, especially that of the estate of the Marquis de San Miguel, which keeps for a great number of years, although very little care is bestowed on the making of it. They complain in the country that the must of the table-land ferments with difficulty; and they add *arope* to the juice of the grape, that is to say a small quantity of wineñ which sugar has been infused, and which by means of dressing has been reduced into a syrup. This process gives to the Mexican wines a flavour of must, which they would lose if the making of wine was more studied among them. When in the course of ages the new continent, jealous of its independence, shall wish to dispense with the productions of the old, the mountainous and temperate parts of

Mexico, Guatimala, New Grenada, and Caraccas, will supply wine to the whole of North America; and they will then become to that country what France, Italy, and Spain have long been to the north of Europe.

END OF VOL. II.

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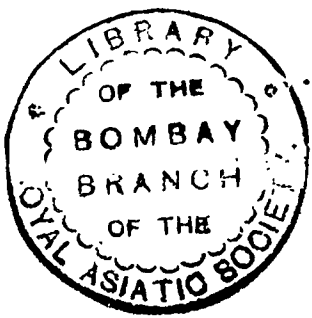

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